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1918

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BIENNIAL REPORT

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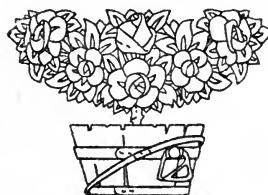
*Montana State Board
of Horticulture*

FOR THE YEARS
1917-1918

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TENTH
BIENNIAL REPORT

OF THE

*Montana State Board
of Horticulture*

FOR THE YEARS
1917-1918

STATE *of* MONTANA





Montana Fruit at the 1918 State Fair.

Montana State Board of Horticulture

HON. SAMUEL V. STEWART
EX-OFFICIO MEMBER, HELENA

F. G. PICKERING
FIRST DISTRICT, JOLIET

T. T. BLACK
SECOND DISTRICT, WHITEHALL

ALLEN PIERSE
THIRD DISTRICT, GREAT FALLS

FRED T. PARKER
FOURTH DISTRICT, MISSOULA

O. M. GERER
FIFTH DISTRICT, HAMILTON

J. C. WOOD
SIXTH DISTRICT, BIG FORK

C. C. WILLIS
SEVENTH DISTRICT, PLAINS

J. C. WOOD
PRESIDENT

A. L. STRAUSZ
STATE HORTICULTURIST

OFFICE, CHAMBER OF COMMERCE BUILDING, MISSOULA.

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LETTER OF TRANSMITTAL

Office of the State Board of Horticulture,
Missoula, Montana, January 1, 1919.

*To His Excellency, Samuel V. Stewart, Governor of Montana:
To the Legislative Assembly of the State of Montana:*

In Accordance with the provision of Section 1932 of the Revised Codes of 1907, amended by the Twelfth Legislative Assembly, I have the honor to transmit herewith the Tenth Biennial Report of the State Board of Horticulture for the years 1917 and 1918.

Respectfully,

A. L. STRAUSZ,
State Horticulturist.

TENTH BIENNIAL REPORT

The activities of the State Board of Horticulture have followed the lines which are outlined by law. The organization maintained during the past two years is similar to that of former years and any changes that have been made have been necessitated by changed conditions in the fruit industry, and by conditions brought about by the war.

The different lines of work may be broadly considered under the following heads:

Fruit Inspection.

Nursery and Nursery Stock Inspection.

Enforcement of Quarantines.

Orchard Inspection.

Advisory Work.

These lines of work cannot be definitely separated, the one from the other, for they overlap in the daily work of the inspectors. In some places fruit inspection is the most important work, and in others orchard inspection and advisory work occupies most of the inspectors' time. Nursery stock inspection requires considerable time during the spring and fall shipping season.

Organization of Inspection Force

The horticultural law divides the state into seven horticultural districts as follows: The first district comprises the counties of Dawson, Custer, Yellowstone, Sweetgrass, Park, Carbon and Rosebud; the second district comprises the counties of Gallatin, Madison, Beaverhead, Silver Bow, Lewis and Clark, Meagher, Wheatland and Broadwater; the third district comprises the counties of Cascade, Fergus, Valley, Chouteau, Teton and Musselshell; the fourth district comprises the counties of Missoula, Mineral, Granite, Powell and Deer Lodge; the fifth district comprises the county of Ravalli; the sixth district comprises the counties of Flathead and Lincoln; and the

seventh district comprises the county of Sanders. Counties formed since the law was enacted all remain in the district which included the original county.

The Board of Horticulture which is charged with the administration of the horticultural law is appointed by the Governor, one member from each district. The Governor is ex-officio a member of the Board. The members from the various districts are chosen with reference to their study of and practical experience in horticulture and the industries dependent thereon. They hold office during a term of four years, and all members serve without salary.

Meetings of the Board are held semi-annually on the third Monday of February and September. Special meetings may be held at any time provided there are matters to be considered of sufficient importance to warrant a meeting. During the past biennium the Board has held its regular meetings and special meetings on May 1, June 2 and June 16, 1917. The special meetings were held relative to the appointment of a State Horticulturist, the position at that time being vacant.

The executive work of the State Board of Horticulture is carried on by the State Horticulturist, who is selected by the Board. It is his duty to enforce the laws of the state relative to the growing and marketing of fruits and traffic in nursery stock, the control and destruction of insect pests and fungus and bacterial diseases, the licensing of firms, persons or corporations engaged in selling or importing trees, plants or nursery stock, to keep a record of the transactions of the Board of Horticulture, to supervise and direct the horticultural inspection service and the dissemination of horticultural knowledge. He appoints local inspectors where necessary. Besides the regular duties prescribed by law, the Board may specify from time to time any other line of work which seems expedient.

Fruit Inspection.

All fruit entering the state or produced within the state is subject to inspection with the exception of blackberries, cranberries, currants, gooseberries, loganberries, raspberries, strawberries, bananas and pineapples. Melons, cantaloupes and tomatoes are also free from inspection. In so far as it is possible to do so, fruit is inspected at the distributing centers and at the points of production. The greatest amount of incoming fruit is inspected at Butte, Helena, Great

Falls, Billings, Havre and Missoula. At these places carloads are received from the western states and from California and are distributed to nearby points. In the Bitter Root Valley, the Missoula Valley, the Flathead Lake section and parts of Carbon county locally produced fruit is inspected for pests and diseases before it is shipped. The railroads are forbidden by law to accept fruit for shipment before it has been inspected and passed as reasonably free from dangerously injurious pests and diseases.

Considerable fruit is sold locally near places of production. Much of this fruit is not inspected and it would be practically an impossible task to attempt a complete inspection of such fruit. Such a course would probably be unwise and of little value, as there could be little likelihood that such fruit would endanger the industry. While some of the fruit, especially apples, is more or less affected with pests and diseases, they are not those which are not already established in the locality. The inspection of fruit should be maintained in Montana with such thoroughness that new pests and diseases will be kept from the fruit sections just as long as is humanly possible, and in such manner that the consumers will be protected from inferior and worthless fruit. It would be well also to have a stronger law regulating the grades of apples and the marking of such grades upon the boxes. However, since co-operative marketing is gaining favor, especially in the Bitter Root valley, there is yearly less and less trouble along this line. Growers now realize that the best business procedure is to put up an honest pack and mark the box correctly.

Nursery and Nursery Stock Inspection.

Not only in Montana, but elsewhere in the United States, the nursery business of late years has been at low ebb. The setting of fruit trees has been very small with the exception of home orchards. Very few commercial orchards have been planted within the last five years. Consequently only the older and well-established nurseries are still operating. The nursery business at present is concerned quite largely with the production of shade and ornamental trees. Most of the trees, of whatever kind, are planted in this state in the spring and during the spring months most of the nursery stock must be inspected. The trees sold in Montana during the past two years have been singularly free from pests as shown by the fact that out of

1,304,293 plants inspected from December 1, 1916, to June 30, 1918, only 385 were found to be unfit for sale.

Nurseries within the state are inspected yearly and if the stock is found to be free from pests and diseases certificates of inspection are granted to the nurserymen. Very little stock is now growing



Spraying with high pressure gives efficient control of orchard enemies.

in Montana. Most of the danger lies in nursery stock shipped into Montana and too careful watch cannot be kept on these shipments.

Enforcement of Quarantines

The State of Montana at the present time is maintaining three quarantines which are printed elsewhere in this report. They are directed against the spread of white pine blister rust, wheat rust, and the alfalfa weevil. All horticultural inspectors are charged with the enforcement of the quarantine provisions. This work naturally fits in with the fruit and nursery stock inspection and the horticultural force is well organized to accomplish results.

Orchard Inspection

Orchard inspection is maintained throughout the fruit-growing sections, the purposes of which are the following:

It enables the inspection service to keep track of the pests and diseases already present and to define their boundaries and retard their spread to adjoining areas.

It reveals the appearance of new pests and diseases and makes it possible to eradicate them or to confine their activity to a restricted locality.

It affords information as to the methods employed by the orchardist in caring for his crop so that individual advisory work can be intelligently given.

Diseases

The following report on diseases and pests mentions only those which are of greatest importance:

APPLE SCAB: (*Venturia pomii* (Fr.) Wint.) This disease is prevalent throughout all the western portion of the state. It annually causes thousands of dollars' worth of damage in misshapen and unsalable fruit. In 1917 it was much more severe than in 1918. In 1918 very little fruit was affected with it in the Bitter Root valley, but in the Flathead Lake region it prevailed quite universally. It is the worst disease in the state and requires thorough work with the sprayer. It can be controlled.

BLIGHT, FIRE BLIGHT: (*Bacillus amylovorus* (Burr.) De Toni.) This is the disease which has done so much damage to Montana orchards in years past. During 1917 there was very little to be seen anywhere. In 1918 it appeared somewhat more in some of the old Transcendent Crab and Alexander trees. It is not, however, doing much serious damage at present to the fruit industry. There is no remedy. Removing the affected part of the tree is the only thing that can be done.

ROOT GALL AND CROWN GALL: (*Pseudomonas tumefaciens* Erw. Smith & Townsend.) This disease is present to a more or less extent in all orchards. The damage it is doing cannot be estimated, but evidently many trees are showing the effects of this disease by their

dwarfed and stunted appearance. There is no remedy. Affected trees should not be planted.

SILVER LEAF: Some orchards show several trees affected with this disease, but with very few exceptions it cannot be said to be doing any damage.

ROOT ROT OR CROWN ROT: It is not known what causes this condition. Some investigators have found the blight bacteria in affected trees and they are inclined to attribute the condition to that disease.

The tree is usually affected at or near the surface of the ground where the bark gradually dies. The roots finally become affected and in some cases the condition extends up the trunk of the tree. Eventually the tree becomes girdled and dies. There is no remedy. Many courses of procedure have been suggested, but they are of very doubtful value. Many orchards are beginning to show this condition, but generally only on a few trees. There is no special cause for alarm.

Insect Pests

BLISTER MITE: (*Eriophyes pyri* Pgst.) Apple and pear trees are attacked by this insect and badly affected trees lose their leaves before the summer is over. The insect is a microscopic mite which feeds within the leaf causing the characteristic browning of the leaves. The injury caused is worse during dry seasons than during rainy seasons. It was exceptionally bad during 1918 and was present in practically all orchards not properly sprayed for it. This was especially true in the Bitter Root valley. The blister mite can easily be controlled by spraying.

BUD MOTH: (*Spilonota (Tmetocera) ocellana* Schiff.) The bud moth larva was apparent in most orchards last year. The damage done was, however, slight, but unless controlled it will become quite serious in the future. It is easily controlled by spraying with arsenicals at the proper time.

CODLING MOTH: (*Carpocapsa pomonella* Linn.) Very little spread of this pest has been noted in the past two years. It is present in most of the cities, but the orchards of the Flathead Lake region, Sanders county and the Bitter Root valley are as yet quite free. There is, however, a slight infestation on the east side of the latter

valley opposite Victor, where it was noted last year. Only a few specimens of apples were found, but unless controlled a few years only would be required to infest the whole valley. The State Board this year is going to use every effort to stamp out this isolated infestation. The codling moth can be easily controlled by proper spray-



Spray material is made in Western Montana—A lime-sulphur plant near Missoula.

ing practices, but it is very difficult to eradicate when once an orchard or district becomes thoroughly infested.

OYSTER SHELL SCALE: (*Lepidosaphes ulmi* Linn.) This is the worst scale insect in the state. It is not of much importance in well cared for orchards, but is present in practically all old and neglected plantings. While it is almost everywhere present it does not spread easily or rapidly from old to well cared for orchards. It can be controlled by thorough and persistent spraying.

SAN JOSE SCALE: (*Aspidiotus perniciosus* Comst.) This dreaded pest is not present in Montana and it is doubtful if it could endure the climate in the fruit section of this state.

RED SPIDER: (*Tetranychus bimaculatus* Harv. and *Bryobia pratensis* Garm.) This pest is present to some extent but has not done a considerable amount of injury to the orchards and is easily controlled by spraying.

APHIDS: (*Many species.*) These sucking insects occur in practically all the orchards and are of many different species. The green aphids which feed on the leaves and growing twig tips are the most common, but in some places the woolly aphids, which feed both on the roots and upper parts of the tree, are becoming established. The green aphids can be controlled by spraying, but satisfactory results in combating the woolly aphids are hard to secure. The total damage to the fruit crop is not alarming.

Physiological Conditions

Many conditions are noticeable in Montana orchards, and elsewhere, which cannot be attributed to any insect pest or to any specific disease organism. While some of these conditions seem to be resulting in considerable damage, others are not sufficiently widespread or common enough to be a serious menace to the fruit industry. Chief among the conditions which may be for convenience classed under this head are winter injury, malnutrition and brown bark spot.

WINTER INJURY: Winter injury is noticeable to a more or less extent in all of the fruit growing districts and is also noticeable in nearly all kinds and varieties of fruit. Some kinds like the sweet cherry are much more easily affected by low temperature than others, but no kind of fruit has entirely escaped injury. In the Bitter Root valley the sweet cherry trees have almost become a memory, considered from the standpoint of commercial production. Only a few tracts remain which are at all in good condition. The winter injury to apple trees has not caused any serious damage in those orchards which are well located and properly cared for, but in the low lying areas many of the young orchards have been seriously set back if not actually destroyed. It is impossible to avoid by any sort of care the effects of low temperatures if conditions are right for winter killing, but by proper cultivation, fertilization of the soil and irrigation it is possible to reduce the effect of bad winters very materially.

MALNUTRITION: This is a general term which is often overworked, but when orchards begin to show yellow leaves early in the summer and when they make only a very short wood growth this condition may safely be attributed to lack of proper plant food in the soil, provided sufficient water has been applied. This condition is especially noticeable in soils which are very shallow. Wherever it is possible fertilizers should be added to these soils either in the form of animal manures or cover crops of some leguminous plants. Many of the diseases such as root gall or root rot may give an appearance similar to trees which are growing in a poor soil, but these conditions should not be easily confused, for poorly nourished trees are quite uniformly yellow within the entire orchard, while trees affected with disease will occur among trees which may be entirely healthy and vigorous.

BROWN BARK SPOT: This is a condition which several years ago caused a great deal of worry to the orchardist, especially in the upper part of the Bitter Root valley and on the west shore of Flathead Lake. The State Experiment Station at Bozeman has done considerable experimental work on this condition, but so far have not been able to attribute its occurrence to any specific disease organism. This condition, known as brown bark spot, has during the past couple of years rather subsided and is not now spreading to any extent and it is even disappearing in some orchards where it prevailed some years ago.

Advisory Work

During the past two years the inspectors in the fruit growing districts have spent a large amount of their time in personal and advisory work among the growers. This has been the most important phase of the work of the State Board of Horticulture in disseminating horticultural knowledge. Each inspector makes an effort to visit every orchard in his district and at that time to give the grower what help he can with respect to the various orchard operations. Beginning with the early orchard work in the spring the inspector visits the orchards and gives instructions in pruning where such seems to be necessary. The pruning work lasts until about spraying time when the efforts of the inspector are directed strenuously toward the securing of proper spraying practices in all the orchards in his district. As the spray machine is the most important implement used in connection with the control of pests and diseases, it is needless to say

that special emphasis is placed upon the advisory work during this period. Spraying is of importance throughout the early summer months, and at no time is the work along this line allowed to lag. During the summer months other lines of work which are taken up by the inspectors regards irrigation, cover crops, thinning, cultivation



A mature orchard near Missoula.

and any questions of orchard management which may from time to time arise.

During the fall when the harvesting season begins the growers are instructed in the proper methods of picking, packing and storing when according to the inspectors' knowledge such instruction is necessary.

The results secured in doing this work seems well worth any effort and expense that may be required, but naturally work of this sort seems more or less slow, yet in time it is certain to bring about changed conditions in many orchards by causing the growers to use better methods and thus secure larger returns from their orchards in money and better fruit produced, and in the satisfaction of having performed their work in the most economical and up-to-date manner.

RECOMMENDATIONS

In order to make the work of the State Board of Horticulture more effective, the following recommendations are made to the Legislature of the State of Montana:

1. A law should be passed providing for the inspection of fruits and vegetables with the authority to condemn and destroy any shipments if the physical condition of such fruits and vegetables render them unfit for food. A record of such inspection should be taken per se as evidence in court of the condition of the produce in question at the time of inspection. Such inspection would safeguard the interests of the shipper, the dealer, the railroads and the consumer. Inspection need be given only upon the request of one of the parties concerned or upon the request of the public. A provision of this sort would not to any extent overlap the work of the United States Department of Agriculture as it maintains only one office in the state. The funds required to operate such a system of inspection would not be large, since the present organization of the horticultural inspection force could be used in its entirety. In making inspections upon request it would be wise to charge a small fee in order to cover the actual cost of the work.

2. It is very necessary that the salary of the clerk in the State Horticulturist's office be increased. It is impossible to retain competent help at the present salary of one thousand dollars per year as provided by law. It is respectfully asked that the law relating to this matter be changed abolishing the position of clerk and creating the position of secretary with the duties of clerk and stenographer, which position shall carry a salary not to exceed one thousand eight hundred dollars per year.

3. On account of the connection which the common barberry has with the spread of wheat rust, a law should be passed declaring barberry bushes a menace and making it unlawful to harbor them on one's premises, giving power to the State Board of Horticulture to eradicate them wherever found. It is not native to the state and the plantings of this shrub are not extensive. It is useful only for ornamentation, but other plants may be substituted for it which are not a menace to farm crops.

FINANCIAL STATEMENTS
Fiscal Year Ending February 28, 1918

Receipts

Regular Appropriation	\$11,500.00
Salary State Horticulturist	2,500.00
Salary Secretary	1,000.00
Horticultural Spray Tax	701.48
Excess Inspection	549.56
Fruit and Nursery Stock Inspection.....	9,714.92
Spray Machinery and Supplies.....	44.00
Nursery Licenses	875.00
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	\$26,884.96

Disbursements

Expenses Board Members at Meetings.....	\$ 339.85
Traveling Expenses	836.93
Orchard Inspection and Spraying.....	5,462.94
Office Expenses	527.72
Fruit and Nursery Stock Inspection.....	13,504.93
Salary State Horticulturist	2,233.32
Salary Secretary	1,000.00
Special Services	287.05
Spray Machinery and Supplies.....	615.06
In Missoula Trust & Savings Bank.....	700.68
In State Treasury—General Fund.....	1,109.80
In State Treasury—Salary State Horticulturist.....	266.68
	<hr/>
	\$26,884.96

November 30, 1918

Receipts

Regular Appropriation	\$11,500.00
Salary State Horticulturist	2,766.68
Salary Secretary	1,000.00
Horticultural Spray Tax	538.06
Nursery Tags	2.50
Maintenance Account	1,510.48
Excess Inspection	803.81
Publishing Proceedings State Horticultural Society.....	300.00
Fruit and Nursery Stock Inspection.....	4,910.65
Spray Machinery and Supplies.....	155.00
Nursery Licenses	550.00
	<hr/>
	\$24,037.18

Disbursements

Expenses Board Members at Meetings.....	\$ 241.60
Traveling Expenses	648.81
Orchard Inspection and Spraying.....	4,592.40
Office Expenses	792.78
Fruit and Nursery Stock Inspection.....	7,250.30
Salary State Horticulturist	1,875.00
Salary Secretary	750.00
Spray Machinery and Supplies	120.11
Special Services	273.15
In Missoula Trust & Savings Bank	1,639.29
In State Treasury—General Fund.....	4,712.06
In State Treasury—Salary State Horticulturist.....	891.68
In State Treasury—Salary Secretary.....	250.00

\$24,037.18

INSPECTION REPORTS**FRUIT INSPECTED**

December 1, 1916, to and including June 30, 1917.

Kind	No. Packages
Apples	173,501
Pears	301
Peaches	8,527
Prunes-Plums	510
Cherries	5,656
Apricots	1,262
Oranges	119,354
Lemons	33,210
Grapes	1,056
Miscellaneous	2,934
 Total	 346,311
Number car lots inspected.....	617
Number car lots Montana apples inspected.....	80

FRUIT CONDEMNED

Kind	On Account of				Total No. Packages
	Seab	Codling Moth	Decay	San Jose Scale	
Apples	1945	50	2	...	1997
Lemons	—	—	—	13	13
 Total	 1945	 50	 2	 13	 2010

**Fruit Inspected—Towns and Districts
From December 1, 1916, to and including June 30, 1917.**

FRESH FRUIT INSPECTED—TOWNS AND DISTRICTS—(Continued)

From December 1, 1916, to and including June 30, 1917.

FOURTH DISTRICT

FIFTH DISTRICT

ט'ז נסיך עליון

TOTALS BY DISTRICTS

NURSERY STOCK INSPECTED
December 1, 1916, to and including June 30, 1917

Kind	No. Plants
Apples	23,098
Pears	457
Peaches	27
Prunes-Plums	4,037
Cherries	6,167
Apricots	59
Shade	165,550
Ornamentals	29,349
Seedlings	19,702
Grapes	1,006
Strawberries	147,369
Blackberries	6,908
Raspberries	8,015
Dewberries	61
Blueberries	378
Currants	4,788
Gooseberries	3,208
	420,179
Number car lots inspected.....	19

NURSERY STOCK CONDEMNED

Kind	On Account of		Total No. Plants
	Root Gall	Quar No. 4	
Apples	66	...	66
Shade	50	...	50
Ornamentals	1	...	1
Currants	6	6
Gooseberries	5	5
Total	117	11	128

NURSERY STOCK INSPECTED—TOWNS AND DISTRICTS
December 1, 1916, to and including June 30, 1917.

FIRST DISTRICT

Town	Apples	Pears	Peaches	Plums	Prunes	Cherries	Apricots	Shade	Ornamentals	Seedlings	Strawberries	Raspberries	Blackberries	Blueberries	Dewberries	Gooseberries	Currants	Total	Car lots	Fees
Billings	1,896	54	1	486	395	105	15,615	4,067		195	11,611	120	1,126		423	495	36,484	1 3/4	\$ 89.41	
Livingston	352			28	434	50	23,725	4,606	5,300	305	13,300	143	1,488	62	520	72	5,877		10.00	
Miles City	1,735	14	3	813	58	54	500	40	500	36	625	74	6	524	36	520	18	4,676	2	119.50
Park City	218	20		58	43	163	77	77	448	40					36	36	18	1,735		13.50
Total	4,201	88	4	1,385	988	54	39,840	8,713		536	30,836	263	2,688	68	999	1,109	91,772	3 3/4	\$ 232.41	

SECOND DISTRICT

Town	Apples	Pears	Peaches	Plums	Prunes	Cherries	Apricots	Shade	Ornamentals	Seedlings	Strawberries	Raspberries	Blackberries	Blueberries	Dewberries	Gooseberries	Currants	Total	Car lots	Fees
Bozeman	251			12	68	2	31,295	10		108	33,632	183	18		380	10	450	279	7,349	\$ 5.25
Butte	1,674	87	5	347	1,302	2	7,083	1,831	4,710	106	4,728	642	12	1,728	18	514	12	74,267	2	79.60
Helena	1,664	112		156	448	43	163	77	448	40	2,204	18	51		36	36	1,728	3,172	46.00	
Harlowton	492																		13.00	
Total	8,584	199	5	546	1,925	2	38,523	1,881		214	45,420	4,115	1,058	61		1,000	291	103,824	6	\$ 143.85

THIRD DISTRICT

Town	Apples	Pears	Peaches	Plums	Prunes	Cherries	Apricots	Shade	Ornamentals	Seedlings	Strawberries	Raspberries	Blackberries	Blueberries	Dewberries	Gooseberries	Currants	Total	Car lots	Fees
Bainville																		60		\$ 16.95
Great Falls	995			562	157	1	36,108	2		69	34,475	1	853		524	414	78,528	2	63.25	
Havre	761			600	185	1	39,612	4,832	133	12,368	205	1,236		429	372	60,733	4	136.15		
Lewistown	702			503	81		2,409	3,031	19,702	4,260	254	782		492	775	32,991	2 1/4	36.75		
Mondak	230			160	160		4,795	2,345	500	1,000	465		1,020		1,020	75	13,590	1	91.25	
Total	2,688			1,665	583	1	85,981	14,580	19,702	202	51,604	2,312	2,483		2,465	1,636	185,902	9 1/4	\$ 344.35	

FOURTH DISTRICT

Town	Apples	Pears	Peaches	Plums	Prunes	Cherries	Apricots	Shade	Ornamentals	Seedlings	Strawberries	Raspberries	Blackberries	Blueberries	Dewberries	Gooseberries	Currants	Total	Car lots	Fees
Missoula	2,410	95	16	277	2,527	2	634	3,575		6	14,957	53	1,534		6	4	26,096		\$ 74.30	

NURSERY STOCK INSPECTED—TOWNS AND DISTRICTS—(Continued)

Town	FIFTH DISTRICT						SIXTH DISTRICT						TOTALS BY DISTRICTS							
	Apples	Pears	Peaches	Plums Prunes	Cherries	Apricots	Shade	Ornamen- tals	Straw- berries	Grapes	Seedlings	Black- berries	Rasp- berries	Dew- berries	Blue- berries	Goose- berries	Car lots...	Total...	Fees...	
Como	2,100	1															1	2,100	\$.25	
Corvallis	537		10															2,100	.75	
Hamilton	2,001	50	100	1			110	543			1,150	150					150	2,650	5.28	
Stevensville									2,002		300	300					300	4,854	2.60	
Total	4,639	50	110	1			110	543		3,152	150	100					300	150	9,605	\$ 8.88
TOWNS																				
Kalispell	573	25	2	54	143		461	57		48	1,400	15	152				18	18	2,976	\$ 16.75
Whitefish	3																	4	1.00	
Total	576	25	2	54	143		462	57		48	1,400	15	152				18	18	2,980	\$ 17.75
Totals	23,098	457	27	4,037	6,167	59,165,550	29,349	19,702	1,006,147,369	6,908	8,015	61,378	4,788	3,208	420,179	19			\$ 821.54	

FRUIT INSPECTED
July 1, 1917, to and including June 30, 1918

Kind	No. Packages
Apples	469,230
Pears	40,799
Peaches	206,410
Prunes-Plums	70,917
Cherries	23,501
Apricots	6,033
Quinces	43
Oranges	96,953
Lemons	41,502
Grapes	189,438
Miscellaneous	7,478
 Total.....	 1,152,304
Number car lots inspected.....	1,431
Number car lots Montana apples inspected.....	257

FRUIT CONDEMNED

On Account of

Kind	Codling Moth	Seab	San Jose Scale	Oyster Shell	Old Boxes	Total No. Packages
Apples	1915	918		67	10	2910
Pears	549					549
Plums			63			63
Quinces	20					20
 Total.....	 2484	 918	 63	 67	 10	 3542

TENTH BIENNIAL REPORT

FRUIT INSPECTED—TOWNS AND DISTRICTS
July 1, 1917, to and including June 30, 1918.

Town	FIRST DISTRICT						SECOND DISTRICT			THIRD DISTRICT			Fees.....
	Apples.....	Pears.....	Peaches.....	Prunes Plums.....	Cherries.....	Apricots..	Oranges...	Quinces...	Lemons...	Grapes....	Miscel- laneous..	Total.....	Car lot.....
Billings	20,673	5,801	17,075	7,860	4,752	202	9,484	7,184	12,050		85,081	131	\$ 751.27
Fromberg	7,105			7,104			392	56		7,209	7	9,583	
Glenlive	3,292									3,740	5	25.00	
Joliet	1,06	615	4,436	789	391	33	384	2,735	682	906		1,812	
Livingston	144	21,358	6,692	1,300	690	6,244	2,735	7,336	2,665	49,920	7	59,86	
Miles City	286	879	5,371	1,015			2,706	291	6,891	24,286	31	33,500	
Park City	6,896	59	952					3		24,049	31	155.00	
Red Ledge	2,923									3,937	3	25.26	
Sidney													
Total.....	63,583	7,354	34,526	11,068	5,143	925	19,210	10,269	26,959	3,276	182,313	251	\$ 1,471.06
Bczeman	6,575	1,138	5,971	672	2,680	2,673	35,412	12,368	74,962	212	15,330	20	\$ 100.00
Butte	52,681	6,690	50,261	26,480	12,892	1,02	1,361	2,282	3,808	27,641.9	320	1,930.72	
Harlowton	12,973	4,833	8,951	1,725	6,636	2,337	40	6,282	3,994	3,996	20,156	327	185.00
Helena	17,093	4,833	17,317	6,637						16,304	75,310	76	508.55
Total.....	89,328	13,612	82,480	35,513	15,229	3,249	40	43,734	16,744	95,286	395,215	453	\$ 2,724.27
Bainville	8,820	800	800	1,800			800			1,200		14,220	
Cut Bank	4,575	2										19	\$ 95.00
Glasgow	4,480										4,480	8	30.24
Great Falls	58,283	9,500	33,596	15,000	1,099	10	14,200	7,800	26,500	165,988	227	41.00	
Havre	29,061	1,897	18,350	1,901	10	4,832	1,198	8,457	7,420	65,706	1,170.00		
Lewistown	19,133	5,121	11,026	4,032	439	99	1,993	11,238	4,201	64,702	79	384.25	
Total.....	124,352	17,320	63,772	22,733	1,538	919	26,452	10,991	47,395	4,201	319,673	395	\$ 2,128.42

FRUIT INSPECTED—TOWNS AND DISTRICTS—(Continued)

FOURTH DISTRICT

NURSERY STOCK INSPECTED

July 1, 1917, to and including June 30, 1918

Kind	No. Plants
Apples	21,348
Pears	329
Peaches	79
Prunes- Plums	6,679
Cherries	5,397
Apricots	6
Quinces	12
Shade	223,766
Ornamentals	51,785
Seedlings	416,593
Grapes	1,451
Strawberries	125,130
Blackberries	3,790
Raspberries	19,936
Blueberries	58
Currants	3,446
Gooseberries	3,263
Mulberries	46
Loganberries	2
Miscellaneous	998
 Total	 884,114
Number car lots inspected.....	26

NURSERY STOCK CONDEMNED

Kind	On Account of		
	Root Gall	Quar. No. 4	Total No. Plants
Apples	50		50
Peaches	1		1
Cherries	4		4
Raspberries	134		134
Shade	25		25
Currants		26	26
Gooseberries		17	17
 Total.....	 214	 43	 257

NURSERY STOCK INSPECTED—TOWNS AND DISTRICTS

July 1, 1917, to and including June 30, 1918.

FIRST DISTRICT

Fees....
Car lots
Total.
Miscel- laneous
Goose- berries
Currant
Blue- berries
Rasp- berries
Black- berries
Straw- berries
Grapes...
Seedling
Orname- tals.....
Shade...
Quinces.
Apricots
Cherries
Prunes Plumis.
Peaches
Pears.....
Apples...

NURSERY STOCK INSPECTED—TOWNS AND DISTRICTS—(Continued)

FRUIT INSPECTED

	1911	1912	1913	1914	1915	1916	1917*	1918
Apples and Crabs	263,760	461,854	436,023	338,321	501,770	346,211	173,501	469,230
Pears	23,083	25,729	16,851	22,010	29,274	22,644	301	40,799
Peaches	119,175	138,249	114,711	205,695	228,049	204,433	8,527	206,410
Plums and Prunes	32,747	39,273	26,450	29,554	44,477	59,485	510	70,917
Cherries	18,657	29,357	20,462	28,035	32,070	14,488	5,656	23,501
Apricots	4,789	6,775	4,167	4,892	4,625	5,404	1,262	6,033
Quinces	539	565	513	364	400	214	43	
Oranges	99,592	93,943	65,980	114,371	161,739	103,007	119,354	96,953
Lemons	25,702	32,208	29,441	27,907	30,138	33,038	33,210	41,502
Grapes	184,871	192,331	76,228	161,715	151,548	155,207	1,056	189,438
Strawberries	44,932	56,316	60,639	91,680	78,463	129,246		
Blackberries	8,598	11,774	7,567	14,023	17,366	12,208		
Raspberries	18,577	17,436	25,978	42,835	45,897	40,080		
Dewberries	443	646	2,302	2,045	560	117		
Blueberries	104	201	733	635	212	791		
Currants	977	1,067	1,027	180	3,968	453		
Gooseberries	856	563	739	824	1,292	297		
Miscellaneous								
	847,402	1,108,287	889,821	1,089,016	1,351,848	1,127,378	346,311	1,152,304

* Includes only 7 months.

FRUIT CONDEMNED

	1911	1912	1913	1914	1915	1916	1917	1918
Apples (old boxes)	746	312	1993	3008	950	2315	1945	10
Apples (for scale)	140	34	750	1688	1447	783	50	918
Apples (for codling moth)	196	238	20	111	640	388	2	1915
Apples (for scale)								67
Apples (for rot)								
Apples (for worms)								
Pears (scale)	2							
Pears (worms)								
Pears (scale)	146							
Pears (codling moth)	72	151	10	420	47	32	86	549
Pears (blight)	7		318	622	360	452		
Peaches (codling moth)	57	7	46					
Peaches (twig borer)	10		35	763				
Peaches (worms)								
Plums (scale)					9			
Plums								
Apricots (for shot hole fungus)	14	40						
Apricots (for scale)		18			5			
Apricots (worms)								
Oranges (scale)	2							
Oranges (worms and scale)	244	12	792	396	396	300		
Lemons (purple scale)								
Lemons (San Jose scale)	183	336	1					
Raspberries (powdery mildew)					1			
Raspberries (use of old boxes)					6			
Gooseberries (for powdery mildew)	30	7						
Quinces (codling moth)								20
Quinces (worms)								
Miscellaneous (violation quar. law)								
	1849	1155	3172	7520	4323	5895	2010	3542

NURSERY STOCK INSPECTED

	1911	1912	1913	1914	2,000	1915	1916	1917*	1918
Roots	2,100	136,763							
Grafts	491,711	209,413	123,850	219,889	96,699	133,606	19,702	416,593	
Seedlings	189,426	9,733	5,263	7,993	3,936	42,063	23,098	21,348	
Apples and Crab Apples	7,528	1,736	1,746	1,880	271	177	1,140	457	329
Pears									
Peaches									
Plums and Prunes	8,489	79,521	14,395	271	9,128	13,897	27	79	
Cherries	39,518	80,671	36,350	95,908	36,090	9,275	4,037	6,679	
Apricots	824	459	440	16,623	50	85	6,167	5,397	
Quinces	61	2	36	1,045	1	22	59	6	
Grapes	673	3,464	7,323	16,121	2,594	3,390	1,006	1,451	
Strawberries	42,733	99,161	184,320	316,813	170,870	203,660	147,369	125,130	
Blackberries and Dewberries	7,038	18,929	9,216	35,513	3,882	5,011	6,969	3,790	
Raspberries	18,139	46,523	49,108	121,138	21,224	26,485	8,015	19,936	
Blueberries		50		113	226	323	378	58	
Currants	4,816	5,604	19,928	19,479	7,957	13,039	4,788	3,446	
Goosberries	5,221	12,417	17,881	29,180	8,447	11,424	3,208	3,263	
Shade	91,205	86,929			82,049	537,379	165,550	223,766	
Ornamentals	41,803	50,725			23,882	116,512	29,349	51,785	
Miscellaneous	761		615,115	784,715	1,060	541		1,046	
Asparagus									
	953,861	842,110	1,085,105	1,665,072	470,282	1,118,584	1,420,179	884,114	

* Includes only 7 months.

NURSERY STOCK CONDEMNED

	1911	1912	1913	1914	1915	1916	1917	1918
Apple Trees (root gall, crown gall, hairy root)	739	287				20	65	50
Apple Trees (root gall, woolly aphis)			210	1548		6	1	
Apple Trees (crown gall)				3				
Apple Trees (blight)								
Pear Trees (root gall, crown gall, hairy root)	20		9			5		
Pear Trees (root gall)								
Cherry Trees (root gall, crown gall, hairy root)	12		3					
Cherry Trees (for root gall)								
Cherry Trees (for root gall, woolly aphis)					107			
Cherry Trees (for crown gall)								
Peach Trees (root gall, crown gall, hairy root)			10					
Curraints (W. P. B. R. quarantine)								
Gooseberries (W. P. B. R. quarantine)								
Plum Trees (root gall, crown gall, hairy root)	10							
Raspberries (root gall)								
Strawberry Plants (woolly aphis)								
Ornamentals (root gall)								
Shade Trees (crown gall)								
Shade Trees (woolly aphis, root gall)								
Shade trees (root gall)								
	821	299	210	1658		57	128	257

LICENSED NURSERIES

Licenses Expiring June 30, 1918

No.	Name	Address
440	R. M. Kellogg Co.	Three Rivers, Mich.
441	Lewiston-Clarkston Nursery Co.	Clarkston, Wash.
442	Albany Nursery Co.	Albany, Ore.
446	Avoca Nursery Co., Tidewater Inv. Co.	Butte, Montana
447	Rhinelander Nursery Co.	Rhinelander, Wis.
453	Hopper's Greenhouse & Nursery	Billings, Montana
454	Owatonna Nursery Co.	Owatonna, Minn.
455	Northwest Nursery Co.	Valley City, N. Dak.
456	Froid Nursery Co.	Froid, Montana
457	Jewell Nursery Co.	Lake City, Minn.
458	Billings Nursery Co.	Billings, Montana
459	Wedge Nursery Co.	Albert Lea, Minn.
460	Oscar H. Will & Co.	Bismarck, N. Dak.
461	Rose Hill Nurseries	Minneapolis, Minn.
462	Hankinson Nursery Co.	Hankinson, N. Dak.
463	State Nursery & Seed Co.	Helena, Mont.
464	Toppenish Nursery Co.	Toppenish, Wash.
465	Washington Nursery Co.	Toppenish, Wash.
466	Henry A. Dreer, Inc.	Philadelphia, Pa.
467	Howard Lake & Victor Nurseries	Howard Lake, Minn.
468	Missoula Nursery Co.	Butte, Montana
469	Oregon Nursery Co.	Oreenco, Oregon
470	Deerfield Nursery Co.	Medford, Minn.
471	Yakima Valley Nursery Co.	Toppenish, Wash.
472	Northern Nursery Co.	Denver, Colo.
473	Gurney Seed & Nursery Co.	Yankton, S. Dak.
474	Stark Brothers Nursery & Orchard Co.	Louisiana, Mo.
475	Brand Nursery Co.	Faribault, Minn.
476	Yellowstone Nursery, O. S. Chilcott	Silesia, Montana
477	E. M. Sherman	Charles City, Iowa
478	Sonderegger Nursery & Seed House	Beatrice, Neb.
501	Salem Nursery Co.	Salem, Oregon
502	Clinton Falls Nursery Co.	Owatonna, Minn.
503	Home Nursery Co., Fred Inabnit	Billings, Montana
504	Gardner Nursery Co.	Osage, Iowa
505	Missoula Greenhouse & Nursery Co.	Missoula, Montana
506	Farmers' Seed & Nursery Co.	Faribault, Minn.
507	Hamilton Nursery Co.	Hamilton, Montana

Licenses Expiring June 30, 1919

No.	Name	Address
508	Albany Nursery Co.....	Albany, Oregon
509	Hopper's Greenhouse & Nursery.....	Billings, Montana
510	Salem Nursery Co.....	Salem, Oregon
511	Jewell Nursery Co.....	Lake City, Minn.
512	Oscar H. Will & Co.....	Bismarck, N. Dak.
513	E. M. Sherman.....	Charles City, Iowa
514	Northwest Nursery Co.....	Valley City, N. Dak.
515	Clinton Falls Nursery Co.....	Owatonna, Minn.
516	Henry A. Dreer, Inc.....	Philadelphia, Pa.
517	Stark Brothers Nursery & Orchard Co.....	Louisiana, Mo.
518	Rose Hill Nurseries.....	Minneapolis, Minn.
519	Sonderegger Nursery & Seed House.....	Beatrice, Neb.
520	Hankinson Nursery Co.....	Hankinson N. Dak.
521	Deerfield Nursery Co.....	Medford, Minn.
522	State Nursery & Seed Co.....	Helena, Mont.
523	Gurney Seed & Nursery Co.....	Yankton, S. Dak.
524	Farmers' Seed & Nursery Co.....	Faribault, Minn.
525	R. M. Kellogg Co.....	Three Rivers, Mich.

HORTICULTURAL INSPECTORS

November 30, 1918

DISTRICT NO. 1

CITY	COUNTY	INSPECTOR
Billings	Yellowstone	Algeo, Ted
Columbus	Stillwater	Kucera, Jas.
Glendive	Dawson	Stokes, W. E.
Joliet	Carbon	*Pickering, F. C.
Livingston	Park	
Miles City	Custer	Fleck, John R.
Park City	Stillwater	Bessette, J. E.
Red Lodge	Carbon	Chapman, L. P.

DISTRICT NO. 2

Bozeman	Gallatin	Parker, J. R.
Butte	Silver Bow	Fossum, J. A.
Harlowton	Wheatland	Ruerup, J. H.
Helena	Lewis and Clark	Malcolm, S. H.

DISTRICT NO. 3

Glasgow	Valley	Whitbread, A. H.
Great Falls	Cascade	Remington, W. A.
Havre	Hill	Trump, E. F.
Mondak	Sheridan	Newcomb, A. S.
Lewistown	Fergus	Kelly, J. W.

DISTRICT NO. 4

Anaconda	Deer Lodge	Kelly, M. J.
Missoula	Missoula	Fox, Edwin

DISTRICT NO. 5

Corvallis	Ravalli	Baden, P. T.
Hamilton	Ravalli	Shovell, Wm.

DISTRICT NO. 6

Big Fork	Flathead	*Wood, J. C.
Kalispell	Flathead	Roush, Roy
Somers	Flathead	Roush, Roy
Whitefish	Flathead	Roush, Roy
Columbia Falls	Flathead	Roush, Roy

DISTRICT NO. 7

Plains	Sanders	Putnam, W. J.
Plains	Sanders	*Willis, C. C.

* Board Members.

ORDER OF THE POSTMASTER GENERAL

Order No. S760.

Office of the Postmaster General,

Washington, April 2, 1915.

The Postal Laws and Regulations, edition of 1913, are amended by the addition of the following, as Section 478½ :

Sec. 478½. (a) When any state shall provide for terminal inspection of plants and plant products, and shall establish and maintain, at the sole expense of the state, such inspection at one or more places therein, the proper officials of said state may submit to the Secretary of Agriculture a list of plants and plant products and the plant pests transmitted thereby, that in the opinion of said officials should be subject to terminal inspection in order to prevent the introduction or dissemination in said state of pests injurious to agriculture. Upon his approval of said list, in whole or in part, the Secretary of Agriculture shall transmit the same to the Postmaster General, and thereafter all packages containing any plants or plant products named in said approved lists shall, upon payment of postage therefor, be forwarded by the postmaster at the destination of said package to the proper state official at the nearest place where inspection is maintained. If the plant or plant products are found upon inspection to be free from injurious pests, or if infected shall be disinfected by said official, they shall upon payment of postage therefor be returned to the postmaster at the place of inspection to be forwarded to the person to whom they are addressed; but if found to be infected with injurious pests and incapable of satisfactory disinfection the state inspector shall so notify the postmaster at the place of inspection, who shall promptly notify the sender of said plants or plant products that they will be returned to him upon his request and at his expense, or in default of such request that they will be turned over to the state authorities for destruction. (Act of March 4, 1915.)

(b) It shall be unlawful for any person, firm, or corporation to deposit in the United States mails any package containing any plant or plant product addressed to any place within a state maintaining inspection thereof, as herein defined, without plainly marking the package so that its contents may be readily ascertained by an inspection of the outside thereof. Whoever shall fail to so mark said packages shall be punished by a fine of not more than \$100. (Act of March 4, 1915.)

(c) The Postmaster General is hereby authorized and directed to make all needful rules and regulations for carrying out the purposes hereof. (Act of March 4, 1915.)

2. When the Secretary of Agriculture furnishes the Postmaster General a list of plants and plant products subject to terminal inspection under the provisions of the preceding paragraph, appropriate instructions in regard thereto shall be issued to postmasters by the Third Assistant Postmaster General, Division of Classification.

3. When a package containing plants or plant products subject to terminal

inspection is received at the post office of address, the postmaster shall at once notify the addressee of the required amount of postage for forwarding it to the place of inspection and return. Upon payment of the required amount, the postmaster shall affix to the parcel stamps sufficient to cover the postage from his office to the place of inspection, and place in an official envelope, to be attached to the parcel and addressed to the postmaster at the place of inspection, the stamps representing the amount of postage furnished by the addressee for its return. The postmaster shall then indorse on the wrapper of the parcel the words, "Forward to....., for inspection,"

(Give post office of inspection)

and transmit the parcel to the postmaster at the place of inspection.

4. (a) On receipt of the parcel at the post office of inspection the postmaster shall deliver it to the proper state official, and if such official shall return it to him marked to show that it has been inspected and passed, the postmaster shall affix to the parcel the postage furnished for returning it to the post office of address and promptly transmit it to that office. It shall then be delivered to the addressee.

(b) If the state official to whom a parcel containing plants or plant products has been sent for inspection shall inform the postmaster at the place of inspection that such plants or plant products are infected with injurious pests and incapable of satisfactory disinfection, the postmaster shall promptly notify the sender that the parcel is undeliverable, giving the reason therefor together with the name and address of the addressee, and stating the amount of postage required for its return and that if the postage is not promptly furnished the parcel will be turned over to the state authorities for destruction. After the sending of such notice, the postmaster shall wait the length of time prescribed in paragraph 8, Section 637, when, if postage be not received by that time, he shall inform the state authorities that the parcel may be destroyed by them.

5. When a parcel containing plants or plant products is returned to the sender or destroyed under the provisions of the preceding paragraph, the postage stamps representing the amount of postage furnished by the addressee for the return of such parcel from the post office of inspection to the office of address shall be sent by the postmaster at the former office to the addressee together with a letter of information as to the disposition of the parcel.

6. If the addressee, after having been notified, as prescribed in paragraph 3 of this section, fails to furnish the required postage for sending the parcel to the place of inspection and return, the postmaster shall so notify the State Inspector at that place and advise him of the amount of postage required for sending the parcel to him. If such official furnishes the postage the postmaster shall, after affixing the necessary stamps, indorse on the wrapper of the parcel the words "Forward to....., for inspection,"

(Give post office of inspection)

together with the words "Postage paid by State," and transmit it to the postmaster at the place of inspection. If the State Inspector shall return the parcel to the postmaster at the point of inspection, marked to show that it has been

inspected and passed, and having postage properly prepaid, it shall be transmitted to the office of address and delivered to addressee. Should the State Inspector fail to furnish the postage for sending the parcel to him for inspection, the parcel shall be treated as other undeliverable fourth-class matter, as prescribed in Section 637.

DANIEL C. ROPER,
Acting Postmaster General.

Plants and Plant Products Addressed to Places in Montana

Office of Third Ass't P. M. Gen.
Washington, Oct. 21, 1915.

The State of Montana has established places for the terminal inspection of plants and plant products, under the provisions of the Act of March 4, 1915, embodied in Section 478½, Postal Laws and Regulations, appearing on page 49 of the May, 1915, Supplement to the Postal Guide.

All postmasters are, therefore, informed that packages containing plants or plant products addressed to places in the State of Montana may be accepted for mailing only when plainly marked so that the contents may be readily ascertained by an inspection of the outside thereof. The law makes the failure so to mark such packages an offense punishable by a fine of not more than \$100.

The plants and plant products subject to terminal inspection in the State of Montana are described as follows:

"All florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plants and plant products in the raw or unmanufactured state, except vegetable and flower seeds: Provided, That this list of plants shall not apply to plants shipped under the certificate of the United States Department of Agriculture for propagation in the plant introduction and field work of the Division of Forestry or Government Experiment Station work in Montana."

Postmasters within the State of Montana shall be governed strictly by the provisions of paragraphs 3, 4, 5, and 6, Section 478½, Postal Laws and Regulations, in the treatment of all packages addressed for delivery at their offices containing any plants or plant products above described as subject to terminal inspection.

The place to which a postmaster in the State of Montana shall send for inspection, after receiving the required postage therefor, under the provisions of Section 478½, Postal Laws and Regulations, a package containing plants or plant products subject to terminal inspection is the one in the list below which is nearest to his office:

Anaconda	Eureka	Lodgegrass
Bainville	Fromberg	Miles City
Baker	Glasgow	Missoula
Belfry	Glendive	Mondak
Bigfork	Great Falls	Park City
Billings	Hamilton	Plains
Bozeman	Harlowton	Plentywood
Brider	Havre	Red Lodge
Butte	Helena	Somers
Columbus	Joliet	Stevensville
Como	Kalispell	Terry
Dillon	Laurel	Troy
Dooley	Lewistown	Woodside
Edgar	Livingston	

Owing to the perishable character of plants and plant products the packages containing such matter must be given prompt attention.

Any failure of compliance with the foregoing instructions, or with the provisions of Section 478½ Postal Laws and Regulations, coming to the attention of any postmaster, should be reported to the Third Assistant Postmaster General, Division of Classification.

A. M. DOCKERY,
Third Asst. P. M. Gen.

QUARANTINES

Quarantine No. 2

WHEREAS, the fact has been determined that a dangerously injurious disease known as the White Pine Blister Rust (*Peridermium strobi* Kleb) exists and is prevalent in portions of the eastern part of the United States as far west as and including Minnesota; and

WHEREAS, there is danger of the introduction of this disease into the great white pine forests of the State of Montana through shipments of five-leaved pines, and currant and gooseberry plants;

NOW, THEREFORE, I. S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim that a quarantine be and hereby is established against the importation into the State of Montana of white pine (*Pinus strobus*), stone pine (*P. cembra*), limber pine (*P. flexilis*) and any other five-leaved pines, and currant and gooseberry plants (*Ribes* and *Grossularia*) from any part of the United States east of and including the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana.

All quarantine guardians and deputy state horticultural inspectors are hereby instructed and required to refuse admission into Montana of any shipments of any of the five-leaved pines above mentioned, and currant and gooseberry plants. It shall be the duty of the deputy horticultural inspectors,

or other quarantine guardians, to deport immediately such shipments or destroy them by burning. All expenses incurred in deporting or destroying such shipments shall be paid by the consignor.

Any person who sells or offers for sale within the State of Montana pine seedlings, currant and gooseberry plants from the above quarantined area in violation of this quarantine order shall be liable to prosecution under the State Laws of Montana.

It is specifically understood and intended that this quarantine proclamation shall revoke all previous proclamations on this subject by me made.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the third day of July, in the year of our Lord one thousand nine hundred seventeen.

(Signed): S. V. STEWART.

Seal.

By the Governor:

C. T. STEWART,
Secretary of State.

Quarantine No. 3

WHEREAS, the fact has been determined that a dangerously injurious plant disease known as Wheat Rust is disseminated and carried by means of Barberry bushes (*Berberis vulgaris*), both of the green and purple form; and

WHEREAS, there is danger of the introduction of this disease into the great wheat fields of Montana through shipments of said Barberry bushes and a further dissemination of said wheat rust through the agency of Barberry bushes;

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim that a quarantine be and hereby is established against the importation into the State of Montana of Barberry bushes (*Berberis vulgaris*) and plants from any point without the said State of Montana.

All quarantine guardians and deputy state horticultural inspectors are hereby instructed and required to refuse admission into Montana of any shipments of Barberry bushes (*Berberis vulgaris*) or plants. It shall be the duty of the deputy horticultural inspectors, or other quarantine guardians, to deport immediately such shipments or destroy them by burning. All expenses incurred in deporting or destroying such shipments shall be paid by the consignor.

Any person who sells or offers for sale, in the State of Montana, Bar-

berry bushes (*Berberis vulgaris*) or plants contrary to this quarantine order shall be liable to prosecution under the laws of the State of Montana.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the twenty-fourth day of April, in the year of our Lord one thousand nine hundred eighteen.

(Signed): S. V. STEWART.

Seal.

By the Governor:

C. T. STEWART,
Secretary of State.

Quarantine No. 4 *

WHEREAS, It has become known to me that an injurious insect, popularly called the alfalfa weevil, and scientifically known as "*Phytonomus posticus*," exists and is dangerously injurious to alfalfa in the State of Utah, and in certain counties in the State of Idaho, to-wit: Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette; and in certain counties in the State of Wyoming, to-wit: Uinta and Lincoln; and in a certain county in the State of Colorado, to-wit: Delta;

NOW, THEREFORE, I, S. V. Stewart, Governor of the State of Montana, under and by virtue of the authority conferred upon me by Chapter 61 of the Session Laws of the Thirteenth Legislative Assembly, do hereby declare and proclaim a quarantine against said state of Utah, and said counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in the State of Idaho; and the counties of Uinta and Lincoln in the State of Wyoming; and the county of Delta in the State of Colorado, and forbid the importation into Montana of the following agricultural products and other articles, excepting under conditions and regulations as specified:

1. Alfalfa hay and other hays of all kinds and cereal straws, excepting the material known locally in Utah as salt grass packing hay, which shall be admitted into Montana provided that such material be cut only between the dates of October 1 and April 1, and that the raking, shocking, stacking, baling or shipping of this material as a commercial product be allowed only after the maximum daily temperature of the season has fallen below sixty degrees Fahrenheit.

Provided further that a certificate be required from the Crop Pest Inspector of the State of Utah showing that these requirements have been met, which certificate shall accompany each shipment. Provided further that no salt grass packing hay shall be held over in the field from one season to another. The use of salt grass hay as a packing material in shipments of fruit, crockery and other materials is permitted, provided said salt grass hay has been cut and removed from the field between October 1 and April 1 as

* Superseding Quarantine No. 1.

above specified and stored in warehouses removed from Alfalfa fields, alfalfa hay or other suspected materials.

2. Fresh fruits and vegetables, exclusive of potatoes, excepting under the following regulations:

a. Shipments for Montana to be made only from points designated by the recognized State Pest Inspection Officers of the State shipping into Montana, said officers to notify the State Horticulturist of the State of Montana by registered mail or by telegraph of the designation of all shipping points in the aforesaid State of Utah, or counties of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in Idaho; or counties of Uinta and Lincoln in Wyoming; and the county of Delta in Colorado; said notification to be sent and its receipt to be acknowledged before any shipments are made to the State of Montana from said designated points.

b. Shipments to be repacked from orchard or field boxes into new, clean boxes, or other fresh containers.

c. All wagons or other conveyances used in hauling to the place where repacking is conducted to be kept free from alfalfa hay or other hays, straw, and all other means of contamination.

d. All packing houses to be at all times free of alfalfa hay, other hays, straw, and other means of contamination.

e. Each lot shipment shall bear an official certificate of the state from which the shipment originates stating that it has been inspected and passed in compliance with these regulations and stating where it was repacked and inspected.

3. Potatoes unless accompanied by an official certificate signed by the recognized State Pest Inspection Officer of the State from which such shipments of potatoes originate, setting forth that the potatoes have been passed over a screen, placed in fresh, clean sacks and packed in cars that are free of alfalfa hay or other means of contamination.

4. All nursery stock, unless accompanied by special certificate setting forth that such nursery stock has been fumigated for the alfalfa weevil in an airtight enclosure subsequent to being boxed, baled or packed for shipment, with cyanide of potassium or cyanide of sodium at the rate of one ounce to each one hundred cubic feet of enclosed space.

5. That no shipment of household or emigrants' movables originating in any state or county designated as infested with the alfalfa weevil shall be brought into the State of Montana by any common carrier, person or persons, unless such shipment be accompanied by a copy of a sworn statement made in duplicate by the owner or shipper after the following forms on blanks which will be furnished to applicants by the State Horticulturist of Montana. Copy No. 1 shall be mailed to the State Horticulturist, Missoula, Montana, and Copy No. 2 shall be delivered to the common carrier agent, with a special certificate appended, to attach to waybill.

State of..... County of..... } ss.

I hereby solemnly swear that I was present during the preparation for shipment of the household or emigrants' goods which this affidavit accom-

panies; that the goods were delivered to the.....
.....(Railroad)
at..... on.....
.....(Station).....(Month, day, year)
constituting (less than) a carload.....
.....(If carload, write initials and car No. here)
to be shipped to.....
.....(Name of consignee)
at..... via.....
.....(Destination).....(Give initials of others lines)
that no nursery stock, vegetables or fruit is included in the shipment and that
no hay or straw (except as provided for under Part No. 1 of this Quarantine)
is included for packing material, or any other purpose, except as food neces-
sary for the livestock in transit to the Montana State line; that the shipment
is made up of the following: Household goods, farm implements, tools, har-
ness, farm wagons, automobiles, stands of bees, livestock (draw a line through
items not included).....
.....(Specify)
feed for animals in transit.....
.....(Specify kinds and amount of each)
and.....
.....(Specify any items not included in previous classification)

.....(Shipper or owner)

Subscribed and sworn to before me.....,
a Notary Public in and for the State of.....,
County of....., this the.....
day of....., 19.....

.....(Notary Public)

My commission expires....., 19.....

The special certificate from the owner or shipper to be appended to Copy
No. 2 of the sworn statement shall be after the following form:

I hereby agree to observe explicitly the requirements of the Montana
Quarantine Order with regard to hay or straw (included as stock feed for use
before reaching the Montana State line); household and emigrants' goods and
other materials, and hereby certify that I have mailed this day one copy
of the foregoing affidavit to the State Horticulturist, Missoula, Montana.

.....(Signature)

6. All railway shipments of livestock unless shipped in cars that are free
of alfalfa hay, all other hays and cereal straws, throughout all that portion
of the journey that is within the State of Utah, and counties of Bingham,
Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Payette in Idaho;
and counties of Uinta and Lincoln in Wyoming; and the county of Delta
in Colorado.

All horticultural inspectors of the State of Montana are hereby in-
structed and required to refuse admission into the State of Montana of all
such articles as are herein designated from said State of Utah; and counties
of Bingham, Cassia, Bear Lake, Oneida, Bannock, Franklin, Power and Pay-
ette in Idaho; and counties of Uinta and Lincoln in Wyoming; and the county

of Delta in Colorado, except under the conditions herein enumerated. If any such articles as are hereinbefore listed be shipped into the State of Montana in violation of this Quarantine they must be at once destroyed or returned to the shipper at his expense.

This quarantine shall not be construed to interfere with shipments of products to the Yellowstone National Park over the Oregon Short Line Railroad, and to Idaho points via Montana over the Gilmore and Pittsburg Railroad.

This quarantine shall take effect and be in force on and after the fifteenth day of July, A. D. 1918.

It is specifically understood and intended that this quarantine proclamation shall revoke all previous proclamations on this subject by me made.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State to be affixed.

DONE at the City of Helena, the Capital, this the sixth day of July, in the year of our Lord one thousand nine hundred eighteen.

(Signed): S. V. STEWART.

(Seal)

By the Governor:

C. T. STEWART.

Secretary of State.

HORTICULTURAL CONDITIONS IN THE BITTER ROOT VALLEY

By P. T. Baden, District Inspector, Fifth District

Horticultural work in the Bitter Root is gradually settling down to business. The prospects for a sane and progressive growth along horticultural lines have never looked brighter to the real orchardist than now.

During the past year some hundreds of acres of young trees have been pulled. No doubt this was a wise move on the part of the owners. Many of the orchards were set without regard to the proper location for an orchard site, and without proper thought as to whether or not those conditions were present which go to make up a good orchard location. In many cases there was not enough water to supply the trees with the proper amount. Many orchards were planted on poor soil. Then, too, the late spring frosts coming year after year in these unfavorable situations resulted in the pulling of the orchards. This is particularly true in the lower parts of the valley where frosts have periodically destroyed any chances there might have been for profitable production. The largest percentage of these orchards was owned by non-residents who depended upon others for the care of their property and, though at first the tracts were well cared for, gradually as the expenses of keeping them up mounted higher and higher, the owners began to lose interest in their ventures and the orchards were neglected. The trees became stunted and many died, and now these young orchards are hopeless cases.

It is these young orchards which are being pulled and the land is being used for general farming. During the next few years many more of these neglected and dying orchards will be done away with.

Many orchardists in first starting out believed that the thing to do was to put every foot of land into trees. They did not realize that an orchard must have a specially adapted location and that near-by conditions of soil, slope, water and air drainage were so different as to make good or poor orchard sites, and that trees could not be well grown everywhere within a certain area with the same facility as other crops. Consequently when the trees grew older and the care

of them took up more time the orchardists found they had too much orchard, more than they could handle in the right way.

The orchardists who are beginning to make a success of their business have in most instances a small acreage in well chosen locations and have done away with the trees on the less desirable parts of the farm and are now putting their time and efforts on what they



Top-grafting may often be used to change poor varieties into desirable ones.

can handle to advantage. The remaining part of the farm is generally profitably used in the production of general farm crops.

Many varieties were planted in the earlier days which were not adapted to conditions here or were not desirable because of their poor quality. These undesirable varieties are being taken out and in many cases replaced with varieties which have proved their worth.

Though the orchard acreage has been thus reduced the crop production has not lessened, but is apparently on the increase. Notwithstanding the late spring freeze of 1918 a very good crop was harvested this fall and if it had not been for this freeze probably the largest crop in the history of the valley would have been harvested.

Throughout the valley there are many old orchards which are sadly neglected. Many of them are family orchards, the owners not wishing to spend time or money in caring for them. They are merely a side issue on the farm and owing to their neglected state are quite unprofitable, giving no more returns than a few apples for the family use and a considerable amount of more or less valuable hog feed. If apples are scarce and high priced some of this fruit is marketed, but it is generally of low grade. These old orchards are gradually being done away with, the owners in some cases keeping only enough trees to furnish fruit for the household. A half dozen well cared for trees will give better returns than a couple of acres of neglected, unpruned and unsprayed trees. Many of these old orchards harbor insects and disease and serve as a source of infection for an entire neighborhood. The sooner these old orchards are taken out or cleaned up, the better will be the conditions for the commercial orchardists and also for those who are trying to take care of a small home orchard.

It is the latter classes of orchardists who are taking more and more interest in their work and who can see that the orchards respond to good and efficient treatment and that apple growing in the Bitter Root can be made to pay. With these men fruit growing is settling down to business and the apple production will soon be increased. There will be a better grade of apples raised with a good deal less percentage of C grade and culls.

While apple production is the main thing with the fruit growers, they have found that it is not wise to put all of their eggs in one basket and consequently they are branching out into other lines of farming. The two most common lines in connection with the orchard industry are the raising of dairy cattle and swine. The raising of livestock not only furnishes additional income but helps the orchardist to maintain proper soil fertility. As the trees grow older the maintaining of soil fertility becomes more and more important and undoubtedly the best method of keeping the soil fertile and in good physical condition is by the use of animal manures. Of course, manure is available for use mainly on farms keeping a number of animals.

The use of alfalfa and cover crops is becoming more general. In connection with this it might be of interest to mention the eight-year cultural tests conducted by the Horticultural Sub-Sation and published in Bulletin 114 of the Agricultural Experiment Station. The

plot which received clean cultivation gave the lowest yield of fruit, while the plots which were seeded to clover and to peas and all growth plowed under gave the highest yields. There was also a great difference in the appearance of the bearing trees. The trees in the clover and pea plots showed a normal, healthy growth, while in the cultivated plot some of the trees had limbs entirely bare of foliage. A soil test in the various plots showed 1,505 pounds more per acre of nitrogen in the upper two feet of soil of the plot with the clover cover crops plowed under than in the plot which received clean cultivation. To bring the nitrogen content of the plot receiving continuous clean cultivation up to that of the clover plot approximately 9,406 pounds of commercial nitrate of soda per acre would have to be applied. It might not be entirely necessary to plow all of the growth of clover under, one or even two crops of hay might be cut and then the clover plowed under.

The prices received for apples this year were better than for many years and some of the farmers who have hitherto neglected their trees, encouraged by the satisfactory prices, will next year take more interest and put more work in the orchards. According to some who have the orchard only as a side issue, the apples were the best paying crop on the ranch.

The apple crop compared very favorably with those of other years. The frosts in the spring did not do near the damage expected and the crop was much larger than estimated. The grade of the apples and the color seemed to be better than usual. Although there was some hail it was not of material consequence except in a few locations. The apples do not appear to have the keeping quality of other years. This is due probably to the exceedingly hot and dry season, the apples maturing earlier than usual.

While sweet cherries are almost a failure here, sour cherries can be grown to perfection in the valley. It would be hard to beat the Morello and Montmorency grown the past season. From one young orchard alone eight hundred and ninety two crates of cherries were picked and shipped.

There was very little nursery stock shipped into the valley the past year. There were practically no new plantings of orchards and the trees that were shipped in were used to replace dead or diseased trees and in some cases blocks of undesirable varieties were pulled

and replaced by more desirable varieties. There was a considerable setting of strawberry plants this last spring.

The main insect pests and diseases in the season of 1918 in the order of their importance were the blister mite, bud moth, woolly aphis, cherry slug and seab.

The blister mite was quite prominent in some of the young orch-



A good spraying outfit is the most necessary special orchard machinery.

ards as well as in the older orchards. It seems that in most cases where it was not controlled the spray was put on too late, the mite having already burrowed into the leaf. A strong lime-sulphur spray early in the spring, just as the buds start to swell, will control the insect. When once under control a dormant lime-sulphur application every other year should keep the orchard practically free from this pest.

The work of the bud moth could be found quite generally the past year. It destroyed many fruit buds, but its work was not great enough to have any material effect on the set of fruit. It can be controlled easily by spraying with arsenate of lead, two pounds to fifty gallons of water. This spray may be combined with the first two seab sprays.

The woolly aphid is found most commonly in the fall about apple picking time when the white masses are present on the tender shoots, in cracks and on injured parts of the trees. While it is hard to control the woolly aphid it can be kept down to a reasonable extent by spraying with tobacco solution, using high pressure so that the liquid will penetrate through the woolly covering to the insects themselves. The inspectors in visiting the orchards the past year found that the apple scab, which had proved most troublesome in other years, did not appear to any degree. This was probably due to the early spraying and to the hot, dry season. There was evidently not enough moisture for the spores to germinate. Although there was practically no scab the past season it is liable to appear next summer should the spring prove to be wet. All orchardists should prepare to spray next year in order to keep the scab down. With the absence of the scab the past year proper spraying should easily control it this coming season.

The cherry slug is another pest which is becoming more and more prevalent. Numbers of cherry trees were almost defoliated by it. The tree naturally is weakened and the fruit does not develop normally. In many cases the tree is weakened for the succeeding season. The arsenate of lead spray will control the slug and should be applied as soon as they begin to appear.

The State Fair.

The annual horticultural exhibit at the State Fair at Helena draws largely from the Bitter Root valley for display fruit. Last year the apple display, although the Fair was held the second week in September, was very creditable to the state. Display boxes of all the standard varieties lined the racks on both sides of the hall and through the center. The size, quality and color were excellent. Seldom, if ever before, had there been such a large collection of perfect specimens of apples. It is to the fruit growers of the Bitter Root that the State Fair and the State Board of Horticulture are indebted for this excellent display. Hard work, untiring efforts and close co-operation alone has made the fruit display at the State Fair possible.

MARKETING THE BITTER ROOT APPLE CROP

By O. M. Gerer, Board Member, Fifth District

This season there has been marketed from the Bitter Root valley about two hundred cars of good quality apples. The demand has been strong and there is no question but that under present marketing conditions twice this amount could easily have been sold. The price received has been satisfactory and the growers who have produced fruit of a good grade have been able to realize more profit from their fruit than for many years past.

Those interested in marketing the crop in the Bitter Root realize perhaps more than any one else the value of having a standard product. In the past it has not been possible for the Bitter Root to put out uniform grades when the growers have been doing their own packing. The last couple of years has seen a great deal of progress along lines of standardization because of the central packing house work which has been done and the supervision of the packing by competent instructors of the packing operations which have been carried on in the individual orchards. The packing supervisors are under instructions from the marketing agencies handling the growers' output. When apples are prepared for market under this plan the organization making the sale can guarantee the grade and pack. It is to be hoped that in the very near future all fruit which is sent out from this valley may carry the stamp of some reputable organization which will be a guarantee to the purchaser of the honesty of the grade and pack. In order to bring about this condition it is necessary that the fruit growers learn the lesson of co-operation and learn it from a practical standpoint.

We, who have been in the marketing end of the business for several years, realize, perhaps more than the growers, that this co-operation, which in the past has been lacking, is the only solution to the orchard problems. It has been proved beyond doubt to the eastern buyers that the Bitter Root McIntosh cannot be excelled by any grown elsewhere in the United States. This fact is conclusively shown by the increased demand for them and it is now only necessary for the Bitter Root growers to put out a thoroughly standard grade and pack. When this becomes a reality and is no longer a dream,

the output of the valley will not supply one-tenth of the demand. If the growers will co-operate in marketing they will find that they will save the cost of competition and no one will deny that competition is costly. Competition between the growers in the Bitter Root has in the past reduced the price so low that apples did not bring nearly what the market would have warranted. If co-operation in marketing can be learned it will save this community thousands of dollars per year. The cost of marketing will be considerably lowered and a much wider field can be covered as market organizations can operate over a larger territory and do it at much less expense than the individual.

Occasionally we hear the question asked, can an orchard be made to pay if properly cared for? An incident which has been brought to my attention this year is that one grower was paid \$546 net for the McIntosh which were produced on 100 six-year-old and 85 seven-year-old trees. This shows what may be done with orchards which have been properly managed. After the good prices which have prevailed this year it is to be expected that the orchardists will take better care of their trees next year than ever before. They are coming to the conclusion that orcharding may be a very profitable undertaking.

At present we still have too many poor varieties in this valley. The poor varieties, either on account of low quality or because of their being unsuited to this section, can never become profitable. It has been proved by experience that the McIntosh and Wealthy are the two best varieties to grow, while in some parts of the valley we may add to this short list the Delicious and Rome Beauty. These varieties grow profitably and are in demand at good prices. As soon as we get the proper spirit of co-operation and have weeded out the undesirable varieties the problem of marketing our apple crop need give us no further worry.

KINDS AND VARIETIES OF FRUIT FOR PLANTING IN THE HOME FRUIT GARDEN IN EASTERN MONTANA.

By A. L. Strausz, State Horticulturist

Eastern Montana is by no means a fruit producing region. Only in some favored valleys has fruit been attempted at all. However, in many places where settlers are filling up the vast plains, enough fruit can be produced to supply the home needs. An orchard, a cow and a garden go far towards making any place seem like home, and the orchard is not the least of these.

The place for planting the orchard should be well chosen. The soil should be the best that the ranch affords. The land should have a gentle slope, preferably to the north and west, but sloping ground is not imperative. Sloping ground will give better air-drainage than level ground and the danger of spring frosts during blossoming season is thus lessened.

It seems from what information is available that the wind break cannot be overlooked when planting fruit trees in eastern Montana. The wind break will protect the trees from the cold winds of winter, will help to hold the snow and leaves. During the summer it will protect the soil from the drying winds and the trees and fruit likewise. The wind break should be planted at the same time the orchard is set and must be composed of trees that will thrive in the region. For this purpose the native cottonwoods are perhaps the best. As a lower screen a row or two of the native sand cherry or wild plum is excellent, as these trees or bushes will furnish some useful fruit. The trees in the wind break should be planted closely together in order that it may be effective when the orchard begins to bear. The orchard trees should not be planted closer to the wind break than forty feet.

Among the kinds of fruit that may be planted with a reasonable hope of success are apples, both crab and standards, pears, plums, cherries, raspberries, currants, gooseberries and strawberries. While this is not at all a comprehensive list a few plants or trees of each

kind should eventually afford a family with sufficient fruit for domestic needs.

Apples

In their order of ripening—Yellow Transparent, Duchess, Okabena, Wealthy, Northwestern Greening, Hibernal and Gano may be recommended. Not all are of high quality, but the trees are very hardy and should succeed in most cases. The Yellow Transparent ripens in the late summer while the Hibernal and Gano are the latest winter sorts. The Martha is perhaps the most worthy crab with the Florence a close second choice. Both varieties seem to be fairly blight resistant.

Pears

Pears would be more or less of an experiment. Of all varieties the Flemish (Beauty) is perhaps most worthy of trial. It is of fair quality and quite resistant to blight.

Plums

The DeSoto, Forest Garden, Wolf and American Eagle should all do well. It might be advisable to plant some of the Hansen Hybrids such as Opata, Sapa and Hanska.

Cherries

The native sand cherry produces very acceptable fruit and ought to be planted. However, the seedlings are rather variable, some producing very good fruit and others very poor. The Compass cherry has proved itself hardy throughout the state, but is self-sterile and should not be planted unless some of the cherry varieties can be grown. The Early Richmond and the Montmorency might succeed under the best care and conditions.

Raspberries

The Herbert, Cuthbert, Ruby and Early King are the best varieties. They are all of the red raspberry type, which is the only kind of the raspberries to be recommended. The canes would need protection during the winter but this could be easily given by bending down the canes, placing a shovelful of earth on the tips and then turning a furrow with a breaking plow onto the row from each side. In

the spring, after the ground has thawed, the canes can be lifted with a pitchfork and the dirt hoed out that has been piled up in the row.

Currants

The Red Dutch, Cherry, White Dutch and White Grape are the best currant varieties.

Gooseberries

The Houghton, Industry and Oregon are acceptable gooseberry varieties.

Strawberries

The State Agricultural Experiment Station recommends the Senator Dunlap as the best variety for eastern Montana. The Clark should also grow satisfactorily. In the home garden the Progressive, an ever-bearing sort, would be especially acceptable, provided sufficient moisture for continuous growth during the summer were available.

Other Kinds of Fruit

It is very doubtful if grapes, blackberries, dewberries, loganberries or black cap raspberries would succeed at all generally in eastern Montana. If they are planted the chance of failure is much greater than the chance of success.

From the above list of varieties and kinds, however, the farmer desiring to set a small home orchard can make his choice and feel certain that they will succeed as well or perhaps much better than if he chose according to his own desires.

Mr. A. L. Strausz, State Horticulturist,
Missoula, Montana.

Dear sir:

I have just returned from the eastern part of the state and will at once answer your letter of recent date.*

The kinds of fruit that may be grown successfully in the eastern or plains part of Montana is very limited, but enough varieties have proved themselves adapted to that section so everyone may have a home orchard. Commercial orcharding, however, should not be at-

* Letter received after the above article was written. Mr. Chilcott is an old resident of eastern Montana and has studied the problem of home fruit growing in his section for many years and is exceptionally well informed on this subject.—A. L. S.

tempted except possibly for local market, that is, for short shipments direct from the grower to the consumer or the merchant.

For planting throughout the eastern part of the state I would limit the apples to three varieties, the Yellow Transparent, Duchess and Wealthy, with some Gano, locally known as Yellowstone Pippin, in the district around Billings.

A good list of crabs may be grown, the Transcendent standing at the head, and I think it may now safely be planted in a small way since the blight seems to have died out; then follows the White Arctic, Florence, Whitney and Excelsior, the latter being an excellent September eating apple although listed as a crab.

The only pear I feel like recommending for trial or limited planting is the Flemish Beauty. They were doing fairly well here in the Clark's Fork valley on some farms until cleaned out by the fire blight.

Plums and cherries seem better adapted to our conditions than any tree fruit, but for success the right varieties must be selected. Twenty-one years ago Joseph Eichhorne and William Hayes, the pioneer fruit growers of Miles City, tested about fifty varieties of plums and they told me the Forest Garden and De Soto were the best, therefore, when planting my own orchard I used them and have always advised others to do the same, never having any reason to change my opinion; but there should be added a few of Prof. Hansen's new plums. I have seen them bearing a very high class fruit at Fairview in the northeastern part of the state on the Dakota line.

Cherries must be limited to the sour varieties. They seem to stand and fruit may be expected about half the seasons in this part of the state, the fruit buds winter killing the rest of the time. Great Falls and Miles City should probably be the northern and eastern limits for planting them because of bud killing.

There are two sorts, however, which can be grown in the balance of the state, the Rocky Mountain Dwarf cherry, which is a low bush bearing a great quantity of large fruit of a wild flavor, usually bearing the next year after planting; and the Compass cherry, which was produced by crossing the Rocky Mountain cherry with a plum. It is a small tree and ripens a fruit in the fall and late summer which might almost be called a plum as it resembles the plums as much as the cherries.

Grapes may just as well be passed up as far as any practical results are concerned.

Most varieties of currants and gooseberries handled by the nurseries seem to do well, but the Downing and Houghton gooseberry and Cherry and White Grape currant may be relied on, therefore I would advise planting more of those than any other variety.

I always pass up the blackberry in favor of the dewberry, using the Lucretia variety. The Cuthbert and Columbia raspberry may be grown by laying and protecting the canes in winter. I have not tried the new sorts, however, which some claim stand the winter fine.

I cannot recommend too strongly that the Senator Dunlap strawberry be used for the planting for home use and market, but if one cares to have them drizzle along all season some Everbearing may be planted. The Perfection is probably the best of this class.

I cannot close without saying something about the forest trees and shelter belts for the eastern part of the state, or rather the colder part of it. There have been hundreds of thousands of poplars planted, and thousands of dollars worth of time spent in caring for them. They do well for a time but just when the planter thinks he has a nice grove they begin to fail and are soon gone.

After twenty-five years' experience I want to advise the farmer to pass up all the poplars under their various names, Carolina, Canadian, Norway and "Sudden Sawlog," and plant the poplar mother nature has given us, "The Sturdy Cottonwood."

The ash, elm, box elder, all of which are native in many parts of the state, should also be used, but aim to get the trees or seed from your own river or creek bottoms and brush coulees.

The Carriganna or Siberian Pea and Russian Olive are hardy and may be used for shelter and hedge.

The Silver Leafed poplar belongs to a different class and may be planted.

O. S. CHILCOTT,

Silesia, Montana.

December 30, 1918.

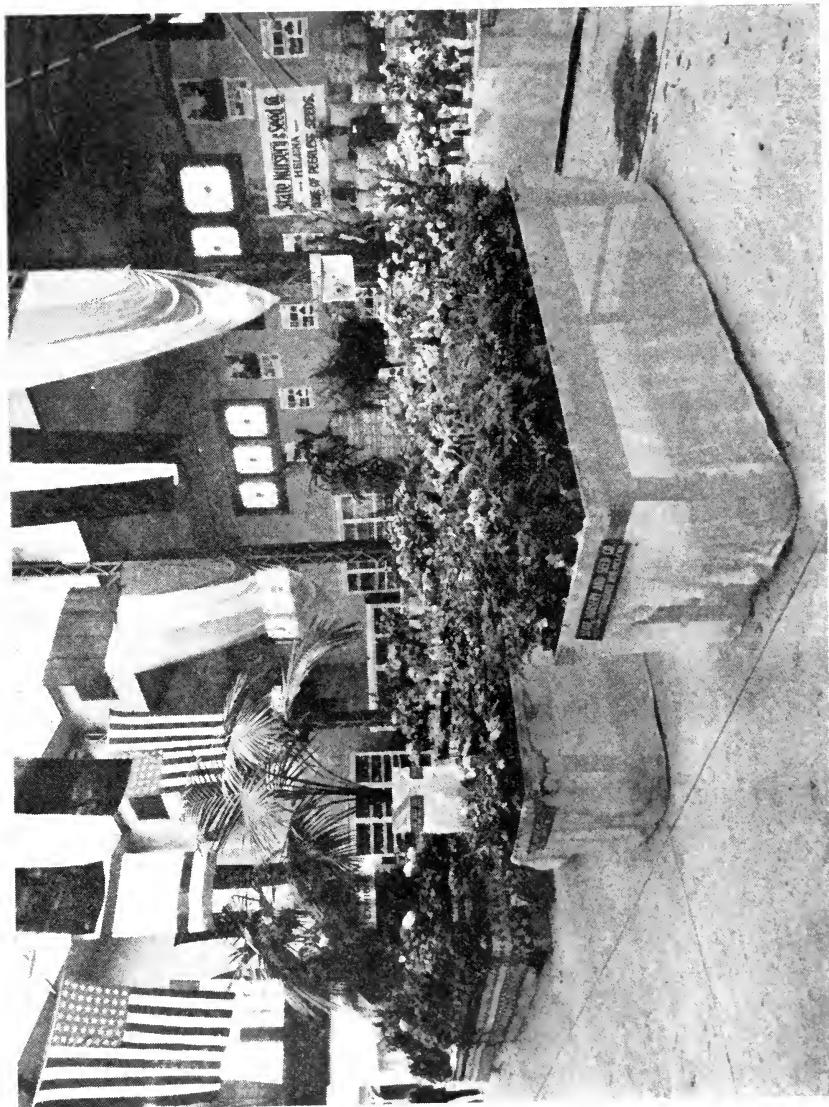
GREENHOUSES IN MONTANA

The greenhouse business in Montana is a line of horticulture that is quite important. Some greenhouses are specializing along certain lines but most of them are practicing a general business, producing flowers, vegetables and vegetable plants in the proper season.

The following is a list of the greenhouses, which is nearly complete:

Name	City	Date established	No. feet of glass	Production
Anaconda Florist	Anaconda	1917	10,000	Flowers and plants
Anderson Greenhouse	Missoula	1910	18,000	Flowers and plants
Billings Greenhouse Co.	Billings	1907	14,700	Carnations, potted plants
Bohn's Greenhouse	Columbus	1908	1,000	Flowers
Brackey, R. H.	Three Forks	1916	1,500	Flowers, potted plants
Butte Electric Ry. Co.	Butte	1899	50,000	Flowers, vegetables
Dillon Greenhouse Co.	Dillon	1913	10,000	Flowers, vegetables
Electric City Conservatory	Great Falls	1908	2,000	Flowers, plants
Englewood Floral Co.	Butte	1911	10,000	Flowers, vegetables
Fiedlen, John	Great Falls	1893	14,000	Carnations, lettuce
Glendive Greenhouse	Glendive	1913	4,500	Carnations, potted plants
Great Falls Floral Co.	Great Falls	1912	5,000	Flowers, vegetables
Hamilton Nursery Co.	Hamilton	1908	4,500	Vegetables, few flowers
Kalispell Gardens	Kalispell	1908	27,000	Vegetables, flowers
Langdon, D.	Bozeman	1898	25,000	Flowers, vegetables
Mihlik's Greenhouse	Bozeman	1910	6,000	Flowers, vegetables
Miles City Greenhouse	Miles City	1910	15,000	Flowers, vegetables
Missoula Greenhouse & Nursery Co.	Missoula	1898	28,680	Flowers, plants, lettuce
Montana Floral Exchange	Great Falls	1890	35,000	Flowers, plants, vegetables
Riverside Greenhouse Co.	Lewistown	1917	10,000	Vegetables, flowers
Seiffert's Nursery	Poplar	1916	1,000	Flowers, plants
State Nursery & Seed Co.	Helena	1890	200,000	Flowers, vegetables
Tracy Floral Co.	Bozeman	1901	17,000	Flowers, vegetables
Trumb, Mrs. C. L.	Havre	1915	2,100	Flowers
Warden Floral Co.	Lewistown	1903	6,000	Flowers, plants

The approximate value of the above plants is \$537,000.00.



Floral Exhibit in the Horticultural Building, State Fair, 1918.

THE ALFALFA WEEVIL

By George I. Reeves

Entomological Assistant, Bureau of Entomology, U. S. Dept. of Agriculture.

The damage which the alfalfa weevil does each year can be estimated by millions of dollars. So many of the little green larvae feed upon the leaves in May and June that the plants soon fail to make headway against the attack and then are gradually eaten to rags. If the field is well cultivated, fertile, and well watered and drained, the first crop may, in favorable seasons, reach maturity without much loss, but usually it begins to look white as if frost bitten a week or more before it is ready to cut, and then it must be harvested at once or be lost. Severe as is the effect upon the first crop, it only begins the trouble, for the attack upon the second crop is so severe as to amount to total loss. The larvae which feed upon the first crop while it is in the field are forced to live upon the stubble after haying, and although a great number of them are killed by the change from the cool, moist shelter of the growing alfalfa, to the blistering heat of the stubble-field, enough of them survive to cover the little foliage which remains, eat the buds faster than the latter can grow, and prevent all growth until they have finished their feeding period, which means until the time when the second crop should have been ready to cut. Their work ends here, but it has cost the farmer half his annual yield of alfalfa hay. The insect spends the rest of the year in the pupal and adult stages, during which it is harmless, except that it is preparing to lay eggs in the dry stems on the ground and the green standing stems from which will hatch the larvae to attack the crop of the following year. This steady succession of severe attacks, year after year with only one exception in the 12 years since the weevil was first discovered in Utah, is one of the most serious features of the alfalfa weevil situation. The regions which have been invaded by the pest are no longer able to produce alfalfa hay in excess of their own needs, but on the contrary, must import it. Nothing more need be said of the importance of this pest to the western states, whose agriculture is based largely upon the alfalfa crop.

The steady recurrence of the weevil attack, while it makes the damage greater, on the other hand gives greater opportunities for its

study than we have in the case of insects which do not appear in large numbers in the same locality every year. Farmers have been able to work out methods of handling their crops which enable them to prevent weevil damage or produce their necessary forage in spite of it. In co-operation with entomologists, they have also devised ways of destroying the weevils, such as pasturing, brush-dragging, and spraying their fields, all of which methods are successful under the right conditions and some one of which can be used under almost any circumstances.

The unusual chance for study which the constant abundance of this insect gives us, has also been utilized to learn how it travels and how its spread may be delayed, if not prevented. It is known to be carried in fresh-cut alfalfa, alfalfa hay, farm produce which has been handled in contact with those commodities and then shipped in tight cars, and in clothing which has been worn through infested fields. Weevils have often been found alighting on railroad trains in the infested region, but there is no evidence and little likelihood that they are carried far in this way. The spread of the weevil seems, from a study of the territory over which it has gone from its original colony at Salt Lake City, to have been principally by flight from field to field or to the wild plants of the alfalfa family, which are everywhere present along roads and in the native prairie. Its spread is practically continuous as far as Sugar City, Idaho; Granger, Wyoming; Price, Black Rock, Skull Valley and Rosette, Utah, but colonies at Paonia, Colorado, and New Plymouth, Idaho, are separated by long distances from the nearest infested territory, and were doubtless planted by railroad or wagon traffic.

The entomologists and quarantine officers of the western states have been vigilant in protecting their people by quarantines against the introduction of the alfalfa weevil, and both because they must expect eventually to be themselves quarantined against and because they realize the hardships which are unavoidably caused by quarantines, they have tried to obtain protection against the weevil with the least possible disturbance of commerce. All hay and straw, whether shipped as forage, bedding, or packing, and all produce which has been in contact with alfalfa, are agreed upon as dangerous when coming from weevil-infested territory. Household goods from agricultural districts, fruits and vegetables are considered safe for admittance to Montana if inspected to insure that they have been

properly handled and are apparently free from weevils. Potatoes are also required to be screened. Nursery stock is rendered safe by fumigation.

In addition to these police measures for delaying the spread of the weevil, all residents within the infested district should be careful not to carry alfalfa hay into free territory and thus aid its natural progress. Without the co-operation of the public, quarantine regulations have little value.

The first step in controlling this pest, which in spite of all precautions, may eventually appear in Montana, is to report its presence speedily, as soon as it is discovered, to the county agricultural and horticultural agents. There are other small brown beetles and green larvae which may be mistaken for the alfalfa weevil, but no chances should be taken with any such suspicious insect.

A REVIEW OF THE ALFALFA WEEVIL SITUATION

By R. A. Cooley, Entomologist

Experiment Station, Bozeman, Montana.

Alfalfa is one of the corner stones of agriculture in Montana and the annual crop is worth in the neighborhood of one and a quarter millions of dollars. When one considers that on the ability to grow this crop depends to a greater or less extent the success of the stock growing industry, and considers further the peculiar relation of alfalfa to western agriculture, it is realized that the above figure falls far short of the real and potential value of this plant to the State of Montana.

The alfalfa weevil (*Phytonomus posticus* Fab.) is an exceedingly injurious insect pest of the alfalfa plant. It is of European origin and made its appearance in Utah, near the city of Salt Lake, somewhat earlier than the year 1904, the first evidence of its presence having been obtained in that year. It has been spreading ever since that time and now is known to be present in the following states and counties:

Utah—		Idaho—		Wyoming—	
Box Elder	Utah	Cassia		Uinta	
Cache	Wasatch	Oneida		Lincoln	
Rich	Duchesne	Franklin		Sweetwater	
Weber	Jaub	Bear Lake			
Davis	San Pete	Bannock	Colorado—		
Morgan	Carbon	Bingham	Delta		
Tooele	Millard	Power			
Salt Lake	Sevier	Payette			
Summit					

The extent of its distribution at the present time, so far as is known, is shown graphically by the accompanying figure, data for which have been kindly furnished us by Mr. George I. Reeves of the U. S. Bureau of Entomology branch office at Salt Lake. We are indebted to the Bureau of Entomology and the Utah Experiment Station for a large part of what is known about the weevil in America and the means of controlling it.

From the figure it may be seen that this insect has not yet reached the boundaries of the State of Montana. Every

possible effort has been made to prevent it from entering our state, for it is believed that should it gain entrance it would eventually become very destructive to alfalfa and entail enormous losses to our agriculture—not for one year only, but for all the future unless natural or more satisfactory artificial means of control are found.

The writer, in company with the State Horticulturist, has visited Utah several times and has made a study of the weevil and its damages and has been much impressed with its destructiveness. When it first appears in a locality not very much damage is done, but after a few years, when it has greatly multiplied, the alfalfa is very much damaged. So far as experience to the present time has shown, this weevil is as injurious now as it was a few years ago; that is, no factor has intervened to reduce the powers of multiplication and destruction, so far as we have information. Where effective control measures have been carried out the damage has been reduced and good crops of hay are grown, but satisfactory returns still come only at the price of vigilance and hard work.

In this connection it should be mentioned that on the occasion of the last visit to the vicinity of Salt Lake, we were much impressed with the abundance of a certain parasite of the weevil which the Bureau of Entomology has introduced and which is rapidly multiplying. There seems to be good reason to hope that much benefit may result from the introduction of this parasite.

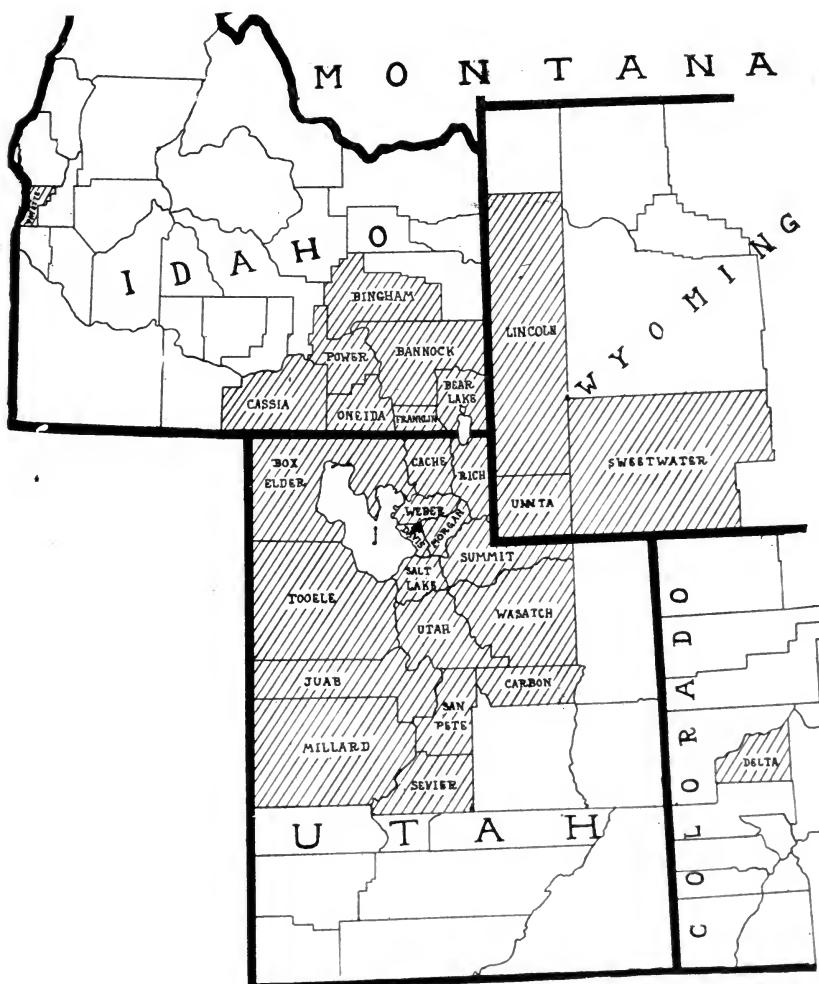
Control Methods Now in Use.

As previously, the main dependence in the control of the alfalfa weevil is dragging just after the removal of the first crop of hay. This method is followed by success and where thoroughly carried out, the farmers are getting very satisfactory returns. The Bureau of Entomology has also conducted experiments in poisoning the foliage of the alfalfa early in the season and has secured encouraging results. It is quite possible that this method may be found to be of much value. For the present, however, poisoning is considered to be in an experimental stage.

How the Weevil Spreads

Up to the past year the alfalfa weevil has occurred only in one continuous region which at first was small and confined to the vicinity of Salt Lake City, but which has rather rapidly increased in size

and now extends through much of Utah and parts of Idaho, Wyoming, Arizona and New Mexico. Recently the weevil has appeared in Delta County, Colorado, and in Payette, Idaho, and in doing so has made jumps past uninfested territory. Undoubtedly the principal means of spreading is by flight and by this means the weevil has widened the region which it occupies by a considerable number of miles



The present distribution of the alfalfa weevil is shown by the shaded areas.

annually. The fact that the insect has now turned up in two isolated localities is of much interest to us, as it is clear evidence that some other means of spreading has been made use of. Without any doubt it has gone into Delta County and Payette County in connection with some kind of merchandise or in connection with the traveling of persons who might readily carry the beetles in baggage or household goods or in hay taken along by immigrants.

It is because of the danger of carrying the weevils out of the state that Montana and other states have established quarantines and are attempting to reduce so far as practicable the danger of introducing the pest. It is now all the more evident that the position taken by Montana some years ago was warranted, since it is now known that the insect has made at least two jumps.

Damage the Weevil Might Do in Montana

The alfalfa weevil has abundantly shown its capability of destruction in Utah. During the earlier years of Utah's experience it was estimated that the alfalfa acreage had been reduced by about one-third in the locality where the weevil had been present long enough to become very abundant. Year by year this territory has become enlarged and the losses have been enormous. To be sure, with vigilance and much expense, alfalfa can be grown in spite of the insect but the difficulties are so great that its presence has been a serious drawback to the territory affected.

To slacken our vigilance here in Montana is simply unthinkable. Were this pest to become established in the alfalfa growing regions of the state the losses year after year, and the set back to all agriculture, because of the peculiar position which this alfalfa plant occupies in the crop system and general agricultural economy, would be a serious blow to the state.

In the figure shown herewith the shaded counties are reported by the Bureau of Entomology to have the alfalfa weevil present. Note that this insect has appeared in two isolated localities—that is, in these instances, it has made jumps past uninfested territory, and there is danger that it may appear in Montana in the same manner.

THE PRESENT STATUS OF THE WHITE PINE BLISTER RUST CONTROL IN MONTANA

1918

By George A. Root

Field Assistant, White Pine Blister Rust Control, Bureau of Plant Industry, U. S.
Department of Agriculture.

The Laboratory of Forest Pathology of the Bureau of Plant Industry, located in Missoula, Montana, in charge of Dr. James R. Weir, has taken precautions during the past two years to prevent the introduction of the white pine blister rust, a very serious disease attacking all species of white pine. The immense stands of white pine in the West are in danger of attack by this disease, if ever the infection is carried thus far.

The western states, especially those of the northwest sections, contain an immense supply of the finest timber marketable. The northwestern part of Montana is included in this western white pine belt, and therefore, the subject of the blister rust work is of vital importance to this state. The destructive character of this disease and the economic loss which it threatens in some of the New England states and New York, should bring the people of this section to a realization of its seriousness and the importance of keeping it from gaining a foothold here.

This disease was imported on white pine nursery stock from Europe and first appeared in Geneva, New York in 1906. Warnings had been repeatedly sent out against the importation of white pine stock from Europe, but in spite of this many subsequent importations were made. The discovery of this disease at various times between 1906 and 1912, finally led to Federal action, which barred all such importations.

The white pine blister rust is not an insect, as many erroneously suppose, but a plant disease and attacks all five-leaf pines, especially the eastern white pine. This disease is similar to the wheat rust, in that it requires another host plant to complete its life cycle. Instead of the alternate host plant being the common barberry, as in the case of the wheat, it requires some members of the genera *Ribes* and *Grossularia* (currants and gooseberries). (See Fig. 1). A

portion of the life of this disease of course is spent upon the pine, producing large cankers, which eventually kill young growth and maim and disfigure old trees by shutting off the supply of sap. In

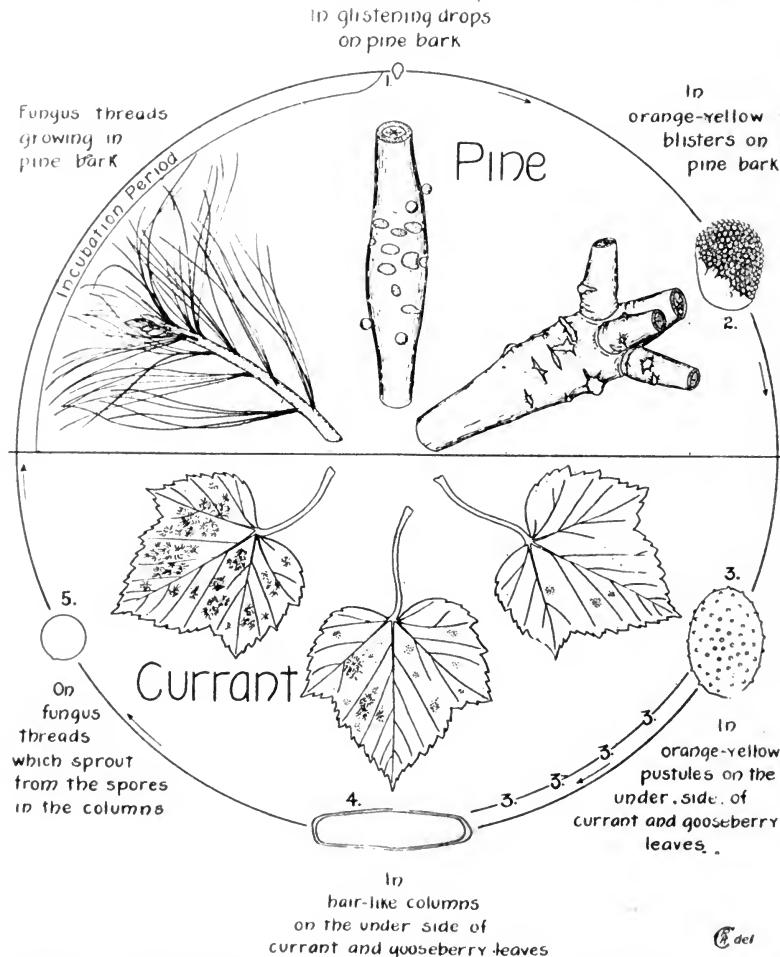


Figure 1. Life cycle of the White Pine Blister Rust. (Loaned by the courtesy of the Bureau of Plant Industry, U. S. Department of Agriculture.)

time there appear along the swelling of these cankers numerous white blisters which eventually break, disseminating orange-colored spores of a powdery nature. (See Fig. 2). These may be noticed from April to the middle of June. The spores are blown far and wide by



Figure 2. White pine tree dying from the effects of the rust. Note the infection on the main trunk and side branches; also the blisters which have broken through the bark, which contain the spores which are carried to currant and gooseberry bushes. (Loaned by the courtesy of the Bureau of Plant Industry, U. S. Department of Agriculture.)

the wind or carried by birds and insects, and may often be carried on the clothing of individuals. These can not reinfect pine, but should they by any of the above means happen to reach currants or gooseberries, another stage of the disease is started on the leaf,

appearing on the under side as a rust. The spores produced on these leaves are also yellow or orange in color, which in turn produce another set, brownish in color, which pass to the pine and cause infection. (See Fig. 3). Thus the cycle is kept up indefinitely. The



Figure 3. Under side of black currant leaf, showing brown-hair or autumn stage of disease. (Loaned by the courtesy of the Bureau of Plant Industry, U. S. Department of Agriculture.)

yellow or summer stage may be noticed on the leaves of wild and cultivated currants and gooseberries from June 1st to the fall of the leaves. The brown-hair or autumn stage (See Fig. 3) may be noticed from about August 1st, often occurring on the same leaves which are still bearing the summer stage. Special attention should be paid to the cultivated black currant, as this is the most susceptible variety. The orange-colored spores upon the currants and gooseberries enable it to spread rapidly from bush to bush over a wide area. Some recent evidence by Government pathologists shows that the disease can winter-over on currants and gooseberries as well as on white pine. It is hazardous, therefore, to ship currant and gooseberry stock at any

season of the year, from states where the disease is known to occur.

The precautionary measures taken by the U. S. Government to prevent the disease from entering the northwest section, consists of the inspection of all nursery shipments of eastern white pine and *Ribes* as far as possible and quarantine regulations. *Ribes* shipments from some of the western nurseries have also been inspected. Special importance is attached to shipments which have come from nurseries where the disease has been found, several of which are in the Middle West and many in the East. Fortunately not many shipments of eastern white pine have been made into Montana, but there are innumerable shipments of *Ribes* from various nurseries. There is at the present time a quarantine "established against the importation into the State of Montana of white pine (*Pinus strobus*), stone pine (*P. cembra*), limber pine (*P. flexilis*), and any other five-leaved pines and currant and gooseberry plants (*Ribes* and *Grossularia*) from any part of the United States east of and including the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana."

Owing to the scarcity of field men during the past season, only a comparatively small part of Montana was covered. However, the territory included in the white pine belt was covered, and the number of inspections made in the various counties is as follows: Missoula, 552, distributed among 21 towns and localities; Mineral, 53, among 9 towns and localities; Ravalli, 206, among 9 towns and localities; Sanders, 399, among 19 towns and localities; Flathead, 694, among 22 towns and localities, and Lincoln, 33, among 3 towns and localities. This makes a total of 1,937 inspections traced in 83 towns or localities in six counties. Very few of these represented white pine shipments. The office has in its files at the present time 8,555 cards of uninspected shipments, distributed among 601 localities, covering the entire State of Montana.

To date the disease has not been found and no record of its occurrence has come to the attention of the office. To any acquainted with the topography of Montana and the limitation of transportation in many sections, one can perceive that a large amount of work has been accomplished, but that a tremendous amount still remains to be done. It is the wish of this office that the people of the state co-operate in this work, and any one interested should communicate with or visit the local laboratory, where specimens of the disease are on exhibition, and where more information concerning the method of spreading and means of prevention can be obtained.

A PRACTICAL METHOD OF FIGHTING WHEAT RUST

By D. B. Swingle

Botanist and Bacteriologist, Montana Experiment Station.

Of all the diseases of crops the stem rust of wheat has long held a place of first importance. No other disease has caused so much loss to the human race. Much time and money have been spent studying the disease and many important facts about it have been discovered, but owing to lack of concerted action on the part of farmers none of the possible remedies have been put into general operation.

The Original Discovery

Many years ago European botanists discovered that the disease was caused by the attack of a fungus—a reddish mould-like growth. They made the further interesting discovery that this fungus cannot pass through its complicated life cycle on any one plant, but requires two: either wheat or some other cereal or grass and the barberry. Commonly wheat and barberry are the two hosts used by this rust.

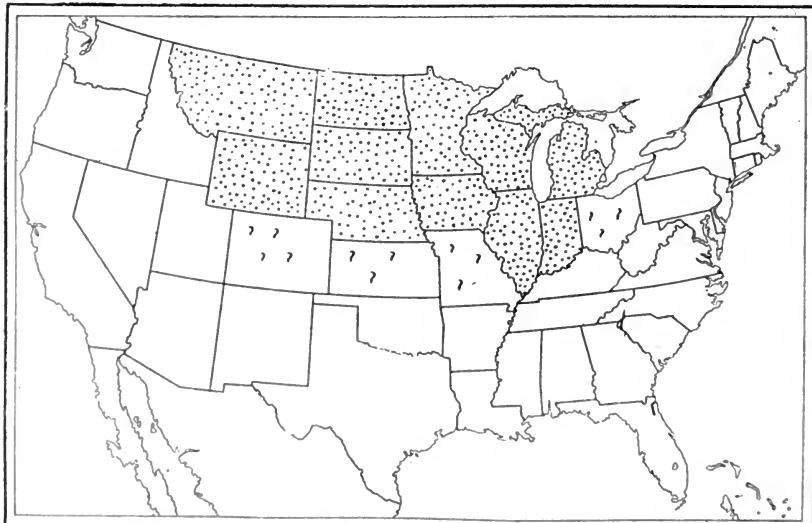


Figure 1. Map of the United States showing Barberry Eradication District. In the shaded states the barberry is known to be of importance in the dissemination of wheat rust, and its eradication is being carried on.

Nor was the discovery limited to these scientific observations, for it was also noted where grain fields were separated by barberry hedges the rust was much worse near the hedges and less severe farther out in the fields. This was many years ago, however, when there was no organization of farmers, no co-operation, and much tendency to scoff at scientific discoveries. For a period of more than fifty years there was much objection to barberry bushes by many farmers who could see with their own eyes the damage done, but while some bushes were removed many others remained and the rust continued to take its toll.

A Great Lesson

The progressive little country of Denmark has taught the rest of the world many useful lessons; and it was this country that demonstrated the practical usefulness of the scientific discoveries concerning wheat rust. In 1903 Denmark passed a law making it a misdemeanor punishable by fine to have barberry bushes growing upon one's property. There was but little opposition to the law, though a few objected and delayed as long as possible in removing their bushes. For the most part the law met popular favor. Prior to 1903 wheat rust had been responsible for terrible losses in the grain fields, but since that date, more than fifteen years ago, there has not been a serious epidemic of the disease in that country.

The great world war, bringing many people to their senses, and stimulating patriotism and friendly co-operation in America, has furnished the opportunity, long sought, to strike a blow at wheat rust, through barberry eradication. The plant pathologists of the United States Department of Agriculture and the State Experiment Stations got together to insist that wheat rust should not destroy wheat while the people were sacrificing to save it.

The Barberry Eradication District

It had already been shown that in the southern half of the United States the rust could get along without the barberry which apparently was not the case in the northern states. There was some uncertainty about the Pacific coast states. Being conservative and keeping on sure ground these plant pathologists marked out a district extending from Michigan west to Montana and south to Nebraska inclusive, from which barberries should be eradicated. Just outside this bound-

dary are other states in the doubtful list, particularly Colorado, Kansas, Missouri and Ohio. (See map, figure 1). In the states shaded on this map active work on barberry eradication was carried on in the summer of 1918. The task was a large one, but a splendid beginning was made.

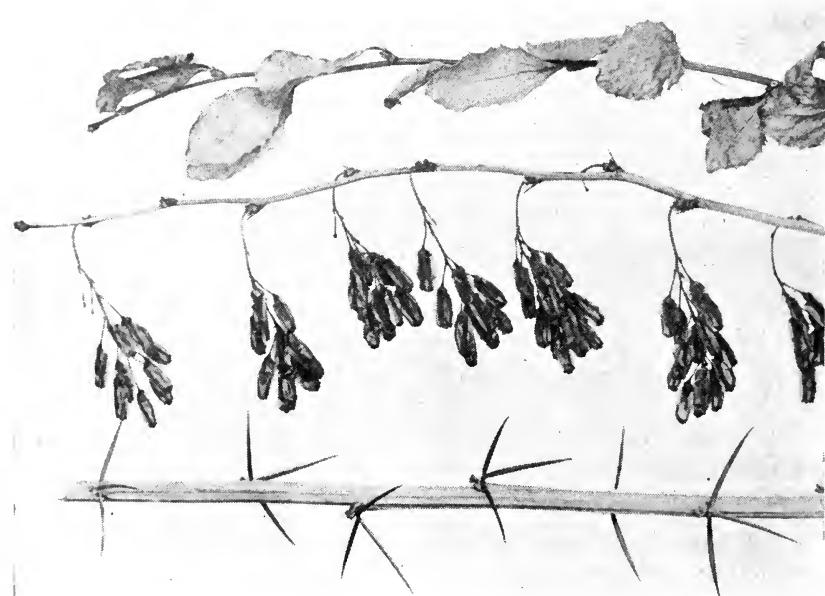


Figure 2. Common barberry which harbors wheat rust, showing notched leaves, berries in clusters and three-forked spines.

Importance of Finishing the Task

One of the questions uppermost in the minds of American people is "which of the good movements started on account of the war will survive, and which will be abandoned?" It is fully agreed that the control of wheat rust is almost as important in peace times as in war times, and if the program of barberry eradication is carried on to completion in the territory indicated on the map the results will rank among the benefits resulting indirectly from this fearful tragedy. Probably wheat rust cannot be entirely done away with by barberry eradication, but there is every reason to expect that it can be so reduced in amount that it will cause very little economic loss.

How to Get Rid of the Barberries

During the past season most states were handicapped in the barberry campaign by lack of legal support. North Dakota has a barberry law and Minnesota and Wisconsin have regulations that give the work some legal backing. In this state Governor Stewart gave



Figure 3. Japanese barberry which does not harbor wheat rust, showing smooth edged leaves, berries borne singly or in pairs and thorns mostly of a single prong.

material support to the movement by issuing Quarantine Proclamation No. 3, prohibiting the importation of barberries into Montana. In most of the states the bushes could be removed only by the consent of the owners. This consent was freely given in most cases, refusals being rather rare. In Montana no one flatly refused. It is very expensive, however, to travel over these great states finding barberry bushes, whereas, if each owner destroyed the bushes on his place the cost would be much less, though some inspection would be needed.

Uniform Barberry Laws

In a meeting of barberry workers held in Minneapolis at the close of the season of 1918, it was agreed that the work could be fin-

ished with least expense by securing in each State Legislature a law declaring barberry bushes a menace to the wheat industry, and making it unlawful to harbor them on one's land. It is believed that the wisdom of this will be readily seen and the necessary laws enacted.

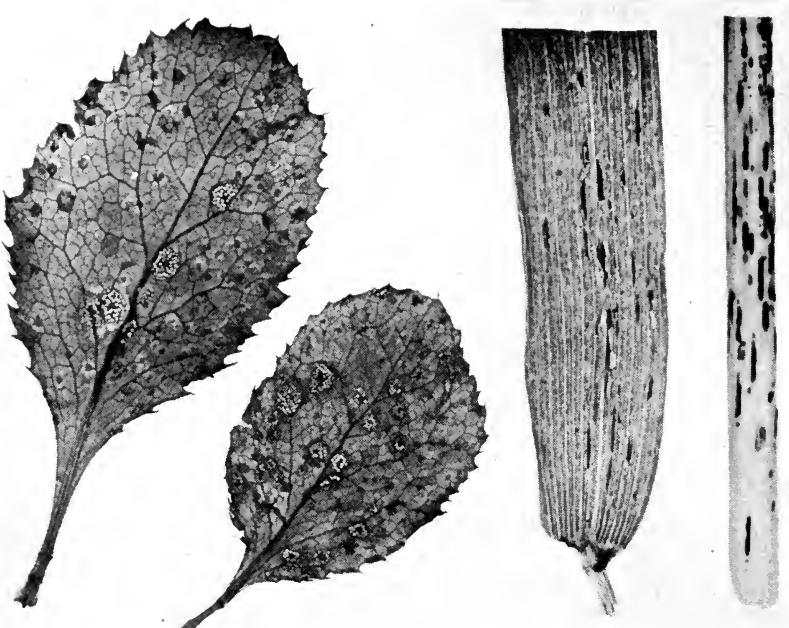


Figure 4. Wheat rust on barberry and wheat.

Enforcement

In different states the laws, if passed, will be enforced in the way most expedient under local conditions. In Montana it will be most economical to have it enforced by the State Board of Horticulture, which already has a good organization for work of this character.

Kinds of Barberry That Harbor Wheat Rust

There are several kinds of barberry of which three are quite common in Montana. Two of these, the common green and the purple leaved, are attacked by rust while the other, the Japanese barberry, is

not. The following diagram gives a comparison of the two. This comparison is brought out also in figures 2 and 3.

DESTROY		SAVE
	Common Barberry Purple-leaved Barberry	Dwarf or Japanese Barberry
BUSHES	Open, upright, stout branches, 2-6 ft. high	Dense, compact, slender branches, 1-3 ft. high
SPINES	Usually 3-pronged; often 5-pronged; and occasionally single near tip.	Usually single; occasionally 3-pronged near base of twig.
LEAVES	Green or purple, 1-2 in. long, finely notched edge.	Green, small, $\frac{1}{2}$ -1 inch long, smooth edges.
BRANCHES	Year old twigs, light brown, older ones grayish, upright or spreading.	Year old twigs, reddish brown, older ones brown, arching.
FRUIT	Red or purplish, in clusters like currants. Berries shrivel and some hang on all winter.	Scarlet, single or in 2's or 3's like gooseberries. Berries not shriveled and many hang on all winter.
FLOWERS	Bright yellow in clusters like fruit.	Pale yellow, arranged as in fruit.

GRASSHOPPER CONTROL IN MONTANA

By J. R. Parker

Assistant Entomologist, Montana Experiment Station.

During the last two years grasshoppers have been very abundant in Montana and there have been numerous opportunities to try out the rather varied control measures recommended in other states and to develop methods of our own.

As a result of this experience the Montana Experiment Station has found that the two most important methods of grasshopper control are the use of poisoned bran mash and the grasshopper catching machine.

Preparation and Use of the Poisoned Bran Mash

The use of mash carrying some form of arsenic has been the most generally used and the most effective and satisfactory control method. It is effective against both young and adult grasshoppers and may be used in all kinds of crops as well as in pasture and waste lands. Applied at the rate of 5 to 8 pounds of prepared mash to the acre, the cost averages from 35 to 50 cents per acre.

The poisoned bran mash is made according to the following formula:

Bran	25 pounds
Paris green or white arsenic.....	1 pound
Salt	1 pound
Cheap molasses or syrup.....	2 quarts
Lemons or oranges.....	6 fruits
Water enough to make a coarse, crumbly mash.	

Distribute the salt and poison throughout the bran by mixing very thoroughly. Dilute the molasses with an equal amount of water. Grind the fruits as fine as possible, after which they should be stirred into the molasses and water. The wet and dry ingredients having been mixed separately, should now be thoroughly mixed together and enough more water added to make a coarse, crumbly mash that will break into small flakes when scattered broadcast from the hand.

When only a small amount of the poison bran mash is needed a galvanized tub makes a good mixing vessel. When a larger amount is

needed it can be mixed in a tank, wagon box, cooking vat, or on a wooden platform, cement floor, or sheet of canvas.

Precautions Against Poisoning

It should be remembered that if poison bran mash will kill grasshoppers it will also kill poultry and domestic animals, if taken in



Figure 1. Mixing poison bran mash on sheet of canvas. The two sides of the canvas are alternately raised and lowered, the ingredients becoming thoroughly mixed as they roll from side to side. After the wet materials have been added, the mixture is again rolled and any lumps which may form are broken with rakes.

large amounts. The mash should be prepared in a fenced enclosure or in places far removed from poultry and livestock. After mixing has been completed all scattered bran mash and any traces of poison should be removed. Plowing the area where mixing has been done is an easy and sure way of getting rid of such remains. Arsenic and paris green containers should be kept where they cannot be licked by wandering stock. Sacks containing poison bran mash should never be left in wagons standing in corrals or farm yards where stock is wandering about. Horses in particular will nose the sacks and often get at the contents, even though the bag is securely tied. Sacks containing poisoned bran mash should be always marked "Poison."

Spreading the Poison Bran Mash

Poison bran mash is spread over grasshopper infested areas by broadcasting from the hand, much as we would sow grass seed. It must be of the right consistency and a certain snap of the wrist must be given in order to have it fall apart into small flakes as it leaves the hand. Every precaution should be taken to see that it does this

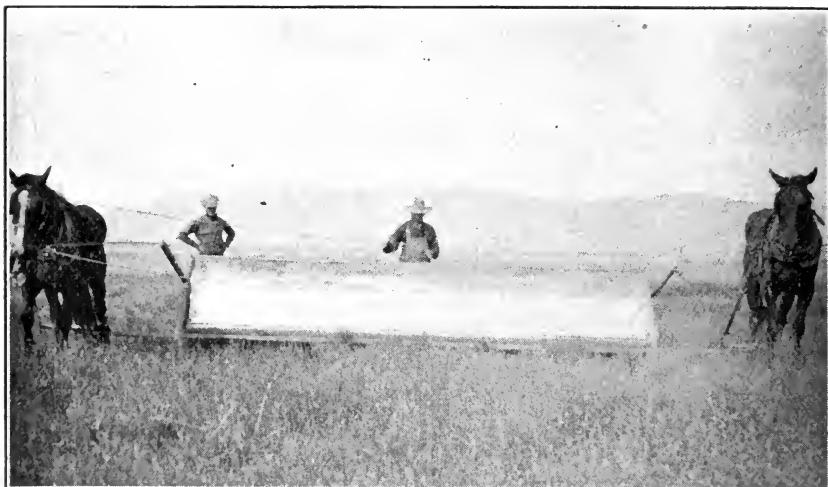


Figure 2. Grasshopper catching machine. Notice the one-man driving arrangement.

for grasshoppers will eat the individual flakes even after they are dry and will not touch dried up lumps which are also dangerous to poultry and livestock. The prepared mash should be applied at the rate of from 5 to 15 pounds to the acre, depending on the number of grasshoppers present. When large amounts are to be scattered, it can be sown from the rear end of a wagon or, if the ground is smooth enough, from the rear of an automobile.

The best time to distribute the poison bran mash is from daylight until about eight o'clock in the morning and from three to five in the afternoon. This is based on the fact that the grasshoppers do most of their feeding just after the sun warms them up in the morning and during a short period before they go to roost at sun down.

Judging the Results of Poisoning

Full effects of the poison bran mash should not be looked for until after a period of 4 or 5 days. Grasshoppers nearly always stop

feeding within 24 hours after taking the bait, but may crawl about for three or four days before dying. Hoppers that have eaten the poison seek dampness and shade, conditions which are shunned by normal grasshoppers and in such places they are often found covering the ground in piles. They also crawl into cracks in the ground and those that die on the surface are carried away by birds, animals, and other insects. The effectiveness of the treatment should, therefore, be judged more by the number of grasshoppers left in the field than by the number of dead grasshoppers found on the surface of the ground.

Grasshopper Catching Machines

Large quantities of grasshoppers can frequently be caught in machines or traps which are drawn over infested areas. The most successful trap used consists of a rectangular wooden box mounted on runners and bearing in front a curved tin shield. As the machine is drawn over the field the grasshoppers jump against the shield and are deflected downward. At the bottom of the shield is a projecting lip upon which the falling grasshoppers strike and which deflexes them through a small opening into the box.

Working plans and full directions for the making of such a machine can be secured by writing to the Montana Experiment Station. The cost of construction will be somewhere between \$15 and \$20.

The grasshopper catching machine can be used in low growing crops, such as alfalfa, grasses, flax and young grain, but is somewhat injurious to ripening grain, corn and seed alfalfa in which the pods are well developed. It is at its best in crops that are from 12 to 18 inches in height and works but poorly in prairie sod where there is little vegetation for the hoppers to rest on.

After several bushels of grasshoppers have collected in the machine, the cover of the box is raised and the contents are shoveled or scooped into burlap sacks. After remaining in the sacks for about a day the grasshoppers will be dead and can then be spread out and dried for chicken feed. Such feed is very high in protein content and has been very successfully used by a number of Montana farmers as a winter feed in place of meat scrap.

Advantages of the Catching Machine Method of Control

The cost of building a catching machine is about the same as the cost of treating 50 acres with poison bran mash. The cost of the first

treatment of infested land would, therefore, be about the same in both methods but the catching machine would be available for future treatments that would cost only the labor of dragging it over the fields.



Figure 3. Eight hundred pounds of grasshoppers caught in two hours and fifteen minutes with the grasshopper catching machine. These were dried and used with great success as winter poultry food.

When crops are attacked by grasshoppers that swarm in from surrounding vacant land, repeated applications of the poisoned bran mash are needed to save the crops and in such cases the cost becomes prohibitive, while with a catching machine the crops can be saved by having a boy or hired man run it a few hours each morning and evening.

It frequently occurs that materials for the poison bran mash cannot be secured on short notice, while a ranch provided with a catching machine is ready for years to come to meet grasshopper invasions at a moment's notice.

Combination of Methods Is Best Practice

Under some conditions such as extremely hot and windy weather or on prairie sod the catching machine is not successful. In cold, wet weather poisoning is difficult. In general poisoning is most success-

ful on warm bright days, while the machine works best on cool mornings and dark days. The wise plan would, therefore, seem to be to use a combination of the two methods, using the one best suited to the prevailing conditions.

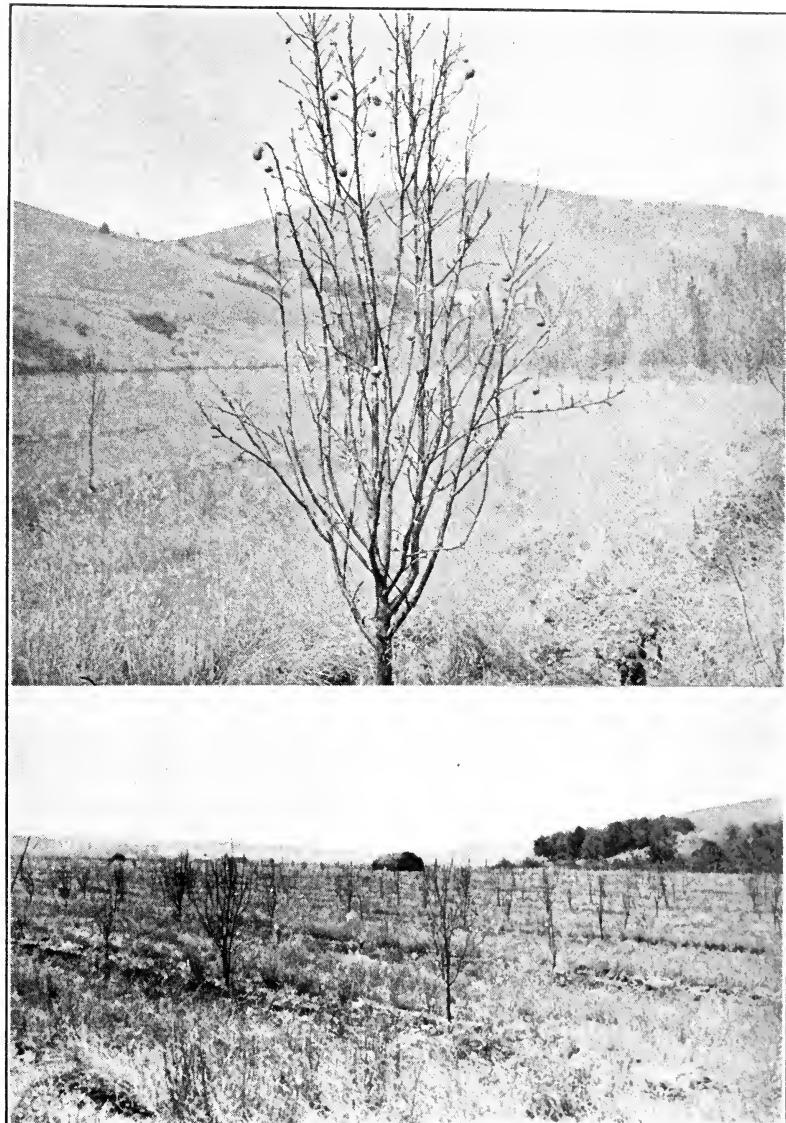


Figure 4. Pear orchard completely defoliated in August by grasshoppers.

HORTICULTURAL EXHIBITS PROMINENT AT THE STATE FAIR

By **Horace S. Ensign**

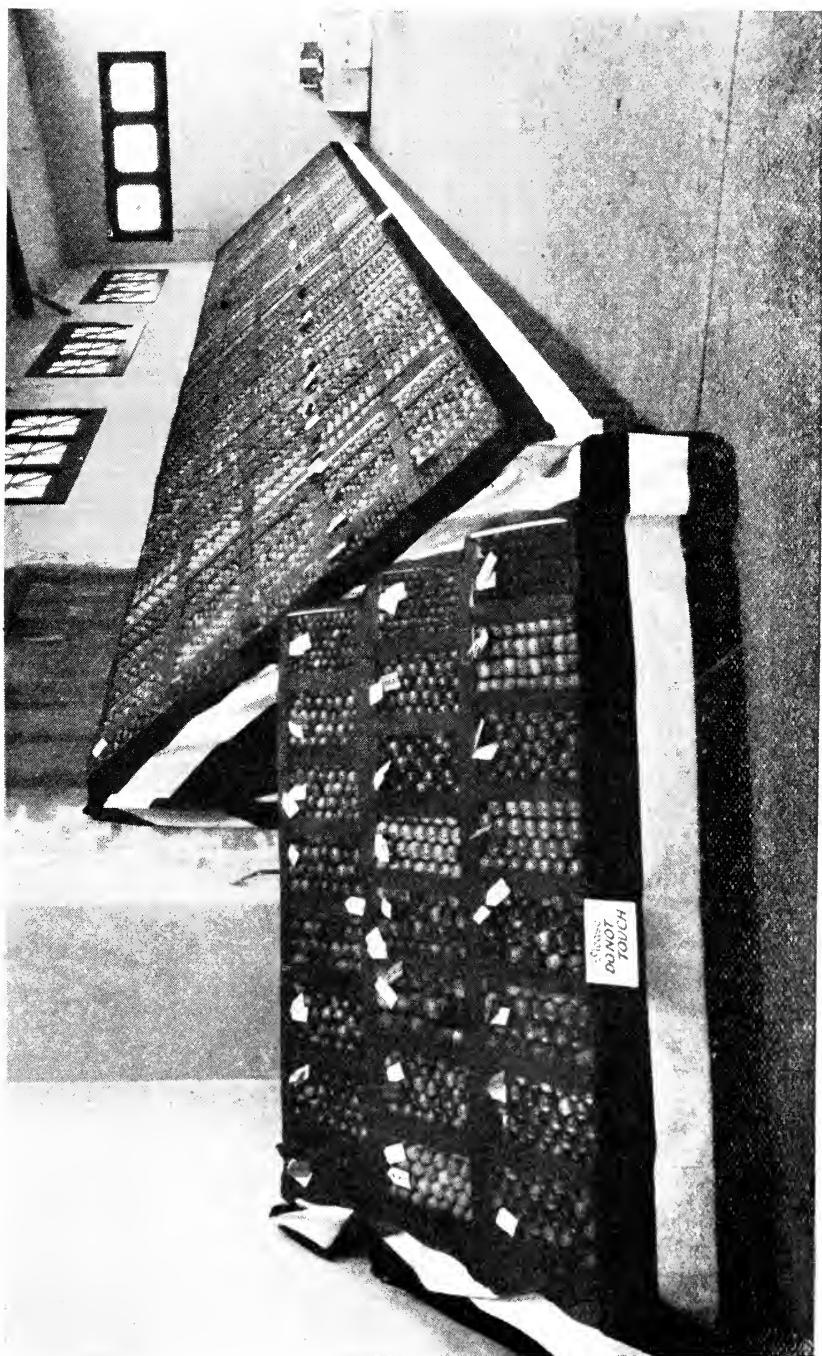
Secretary Montana State Fair.

The horticultural display at the 1918 State Fair was one of the big features of the exposition in spite of the apprehension felt by many people owing to the early dates of the fair. A total of 330 entries were made in this department, of which over fifty per cent consisted of apples—apples of more than fifteen different varieties comprising all the popular commercial types raised in Montana such as McIntosh, Jonathans, Wealthies, Delicious, etc. Seldom, if ever, has there been a more comprehensive display of fruit at the Montana State Fair. It demonstrated conclusively that fruit growing in Montana is not only holding its own, but is making forward progress.

The State Fair will be held early again this year and it is needless to worry or feel any anxiety as to the showing that will be made. The outcome of the 1918 fair and the experience of fruit exhibitors during the past season should prove sufficient answer to those more or less misguided persons who insist that "it can't be done." The chief concern for 1919 among growers should be: "What methods should I adopt to build up and develop the standard and more nearly perfect the varieties of fruits in my orchard?"

The first essentials, of course, are careful selection of land and varieties of fruit to be raised. The State Horticulturist should be consulted on these points as he can undoubtedly give many valuable suggestions that will save money and forestall disappointment. The advice of experts is always helpful. Make the most of it.

The next step in building up standards lies in exhibiting at the state and county fairs. The lessons to be gained from comparison of fruit on the judge's table and the knowledge acquired by attentively following the judging cannot be overestimated. Many fruit growers have been put on the right track in just this way. They have discovered slight deficiencies of which they were previously unaware—deficiencies that lowered the standards of their fruit. They have learned how to eradicate or remedy these faults through observation and information gleaned by reason of exhibiting at the fairs.



The best in the State. The small rack contains one-box entries at the 1918 State Fair.

And quite aside from the matter of developing standards, awards received at the State Fair greatly enhance the value of the fruit and increase the prestige of the grower. A grower with a nice collection of blue ribbons to his credit never experiences any difficulty in disposing of his fruit crop at the highest market prices. The advertising that he receives as a direct result of exhibiting at the State Fair, even though he may not win a large number of premiums, is always effective and is worth dollars and cents to any exhibitor. He is catalogued as a "progressive grower" merely by reason of the fact that he exhibits at the State Fair.

And quite aside from such individual considerations as already mentioned, there is the very important matter of helping to promote the fruit industry as a whole to be considered. The man who does not have sufficient vision to see beyond his own limited individual sphere is a clog in the wheel of progress. But the fellow who embraces an entire community, county or state in the scope of his vision and does his utmost to aid in the development and general betterment of that community or state—he is an empire builder and a true promoter of progress. And that's the class in which the exhibitors at the Montana State Fair are listed. They are aiding in the education of their fellow workers in various lines of industry—their's is a service to Progress and Humanity.

SPRAYING PROGRAM (From Circular 36, Montana Agricultural Experiment Station.)

Combinations to be sprayed for	I Dormant. Just before leaf buds open	II Lime-sulphur; With no blister- mite	III Just before flower buds open ("in the pink")	IV When petals have nearly all fallen.	Two weeks later.	Notes. (At end of table.)
Scab. Oyster-shell scale (or blister- mite).	Lime-sulphur; With no blister- mite	Lime-sulphur.	Lime-sulphur.	Lime-sulphur.	Lime-sulphur.	Note 4.
Scab. Green aphis (or woolly aphis)	Omit.	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1 and 4.
Scab. Codling moth (or bud moth)	Omit.	Lime-sulphur.	Lime-sulphur, with ar- senate of lead, 4 to 50	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 2, 3 and 4.
Scab. Green fruit worm.	Omit.	Lime-sulphur.	Lime-sulphur.	Lime-sulphur.	Lime-sulphur.	Note 4.
Scab. Oyster-shell scale (or blister- mite).	Lime-sulphur; With no blister- mite	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur.	Notes 1 and 4.
Scab. Green aphis (or woolly aphis)	Omit.	Lime-sulphur.	Lime-sulphur with ar- senate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1 and 4.
Scab. Oyster-shell scale (or blister- mite), Codling moth (or bud moth)	Omit.	Lime-sulphur; With no blister- mite	Lime-sulphur, with ar- senate of lead, 4 to 50.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 2, 3 and 4.
Scab. Green fruit worm.	Omit.	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur.	Note 4.
Scab. Green aphis (or woolly aphis) Codling moth (or bud moth)	Omit.	Lime-sulphur; With no blister- mite	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1, 2, 3 and 4.
Scab. Green aphis (or woolly aphis)	Omit.	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1 and 4.
Scab. Green fruit worm.	Omit.	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1 and 4.
Scab. Codling moth (or bud moth) Green fruit worm.	Omit.	Lime-sulphur; With no blister- mite	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1, 2, 3 and 4.
Scab. Oyster-shell scale (or blister- mite), Green aphis (or woolly aphis)	Omit.	Lime-sulphur; With no blister- mite	Lime-sulphur with ar- senate of lead, 4 to 50	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1 and 4.
Scab. Green aphis (or woolly aphis) Codling moth (or bud moth) Green fruit worm.	Omit.	Lime-sulphur.	Lime-sulphur with to- bacco extract.	Lime-sulphur.	Lime-sulphur with arsenate of lead, 2 to 50.	Notes 1, 2, 3 and 4.

TENTH BIENNIAL REPORT

Seab.	Oyster-shell scale (or blister-mite).	Lime-sulphur.	Lime-sulphur with arsenate of lead, 4 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.
Scab.	Codling moth (or bud moth).	With no blister-mite.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Lime-sulphur with arsenate of lead, 4 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.	Lime-sulphur with arsenate of lead, 2 to 50.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Arsenate of lead, 4 to 50.	Arsenate of lead, 2 to 50.	Arsenate of lead, 2 to 50.	Arsenate of lead, 2 to 50.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Arsenate of lead, 4 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Arsenate of lead, 4 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Omit.	Omit.	Omit.	Omit.
Oyster-shell scale (or blister-mite).	Green aphis (or woolly aphis).	Lime-sulphur.	Arsenate of lead, 4 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.	Arsenate of lead, 2 to 50 with tobacco extract.
Oyster-shell scale (or blister-mite).	Codling moth (or bud moth).	Green fruit worm.	Omit.	Omit.	Omit.	Omit.

Note 1.—If either kind of aphis appear later, spray with tobacco extract and soap. For treatment of the root form of the woolly aphis, see Circular 17, Mont. Agr. EXP. Station, page 128.
 Note 2.—For discussion of the August spraying for the codling moth, see Circular 17, Mont. Agr. EXP. Station, page 137.
 Note 3.—In case the bud moth, is present, the arsenate of lead in the spray applied two weeks after the petals fall may be omitted.
 Note 4.—For discussion of a later spray for seab, see Circular 37, Mont. Agr. EXP. Station.

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State Horticulturist.





